FOOD INDUSTRIES

manufacturing and processing

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Perhaps the Fault Is One of Management

FAR-SIGHTED COMPANIES provide for the systematic recruiting of a few men of advanced technical training into the ranks of their employees, in order that men will be available who will later have a better understanding of the fundamental principles of their work. A far greater group of concerns, however, act on impulse toward the same end, without a definite program in view, and take on a few recent graduates in the early summer. Some come in accidentally; others are definitely sought out; but in a few months, as a rule, they are nearly all gone—particularly those with the most pep and ginger—and the management is inclined to decide that it was a poor idea. Why should this occur?

A FEW NEWCOMERS make good from the outset, because they know how to work, but most of the boys are due for a lot of heartaches and misery while they are learning what the work is all about and what life is for. Unfortunately, some of them seem never to learn.

TO ADAPT these impatient young racehorses to the day's work is a serious task. Plant executives, whether technically trained or not, know that there are many deficiencies in a formal education, and that the recent graduate is due for considerable debunking. He has been told so frequently that the world is looking to him for leadership that he may actually believe it. He may not have been told, however, that he will never be a leader until he has followers—the fundamental difference between most of the college trained and non-college workmen becomes most apparent here. Thus he wonders what it is all about when he is pushing a broom or a truck, loading a car, sweating over a machine, or running routine analyses. Here is where many quit.

WASTE of this sort may be avoided by explaining things to the technical recruit early in the game—after the first four weeks, if possible. Be frank with him Tell him very clearly that the only reason any concern has for being in business is to make money for the stockholders; that he is employed for that very purpose, and not to revamp the whole plant or to develop new processes unless it is clearly shown, after he has acquired mature judgment, that by so doing the stockholders can get more money. He must learn that a factory is not a laboratory for his own amusement or edification. Young men, whether college men or not, have a tendency to regard an experiment as an end in itself, and not as a means to an end. The recent graduate, particularly when he has had scientific training, has just come to you with four years' experience in making nothing but experiments. If you keep this in mind, you can save yourself a lot of embarrassment and the young man a lot of trouble, by forbidding at the outset unauthorized experiments. But at the same time he should be told how to go about obtaining permission to try something new and be impressed with the necessity of "selling" his foreman or superintendent on the idea.

ALSO IMPRESS upon him that he must quickly learn how to get along with his fellow workers, and that he can do this by being unobtrusively friendly, but not talking too much, and that he must forget that he ever saw a college. Show him that promotion must come through the routine steps upward and that be can be made a foreman only after he has learned how to work, mastered his job, and has learned how to persuade others to do things his way; in other words, has learned how to handle men.

THE BOYS should be shown that the job they are hired to do is the job at hand—that they were not hired to be kept in reserve to take the president's job next year; that life and living are today; not tomorrow. If you really want these educated employees, it will be your misfortune if you fail to help them to become adjusted to ordinary life while they are still in your employ. After they are gone it will be too late. If they get disgusted and quit after a few months, you will have wasted your time and some of the firm's money. Give yourself a break!

EDITORIALS

JULY, 1930

Creating a Market for A Billion Pounds of Skim Milk

"IF ALL the casein used in this country were made in the United States, our dairy producers and dairy manufacturers would find an industrial outlet for an additional billion pounds of their skim milk." The director of the U. S. Bureau of Dairy Industry is the authority for this sweeping and important conclusion. And that bureau is not content with mere statistical summary. It is proceeding to explain how the American milk products industries can avail themselves of this enlarged market.

The principal criticism directed against domestic casein apparently is lack of uniformity and lack of high quality. Users of casein cannot be plagued with troubles such as those which necessitate day-to-day modification in formulas to suit each new lot of casein. The bureau officials believe that all the defects involved can be remedied and that standard American casein can be placed on just as high a plane as any of the imported material, a plane already attained by a considerable amount of American production.

The bureau is ready to co-operate by explaining the results of its researches to any casein maker who desires to make a low-ash, highly adhesive, readily soluble casein which has good-spreading and proper-viscosity characteristics to meet the needs of those users who must have only the best grades. Furthermore, the bureau is willing to co-operate in establishing casein grades that will enable clear contractual relations to be set up between makers and users.

Skim milk is not altogether a waste product in America, but the dairy products industries could well take advantage of the bureau's offer of closer co-operation in raising the value of this byproduct by more complete industrialization. With the increased tariff just granted by Congress the economic position of the casein industry should now be placed on a reasonably profitable status.

Try It Yourself

MANAGING a canning factory or any other seasonal plant, where large numbers of help are temporarily employed, is a task that requires so much attention that a superintendent is likely to overlook many of the little things which go to conserve the energy of employees and in turn save the money that is invested in their services.

Disregarding all humanitarian motives, we feel that it is nothing short of an economic crime to fail to provide the most comfortable working conditions for employees that it is possible to provide. In the coming summer, a great many people who ordinarily would be occupied elsewhere will be employed in plants on temporary work. On account of economic necessity they will accept whatever work they can get; but this should not be seized upon as an opportunity to get all that there is out of these persons simply because they are forced by necessity to do a form of work to which they are not accustomed.

We recommend that factory executives study the problem very carefully and determine what should be done in each individual plant to make the working conditions as desirable and comfortable as possible. No better way of finding out these things is known than that of actually performing the work oneself. It may seem absurd to urge a high-priced man to perform the operation that can be done by a woman working for 25 or 30 cents an hour, but if he will devote himself to this work for only a few hours, working as a unit in his crew, he will learn many very surprising and valuable facts. If he does not already know it, the person who is engaged in making these studies will perhaps discover for the first time that, when the working station is not properly arranged, his arms will be either too high or too low, and he will quickly tire.

One of the easiest efficiency methods for handling employees is to adjust their work so that the forearm always is horizontal. One very easy way of producing this condition is to provide small stands or boards with blocks of differing heights nailed to their ends, so that the employee can choose the one that is best suited for him. A little care in this respect makes for real dividends, and it has an excellent psychological effect when the employee realizes that management is thinking of his welfare and comfort.

Deliberate Judgment Required to Appraise the Tariff

BECAUSE the newly enacted Hawley-Smoot tariff is an instrument that may affect the prices for the raw materials of the food industries, the food manufacturer has a very direct interest in the tariff, as well as an indirect interest in its possible relation to his export business and to domestic business in general.

In the great international game of threat and counter-threat, the showdown on tariffs is rapidly approaching. As we go to press it is difficult to determine whether the squawks at home are based on greater wisdom than the squawks abroad. Dire threats of reprisals and disaster to business in the United States are coming from foreign and from certain domestic sources. On the other hand, from some of our own politicians are heard absurdly optimistic utterances to the effect that business will be on the upgrade in thirty days after the law becomes effective.

To neither of these extremes do we subscribe. The

new tariff will not restore the abnormal prosperity of the first half of 1929. Neither is business going completely to the dogs because of foreign disapproval. But it is bad business to antagonize our customers, although, fortunately, it is sometimes possible to quarrel with them without losing them completely.

We do not like the law, because it is based too much on local domestic politics and too little on common sense and exact science, yet we would point out that instances exist today in which foreign countries have had tariffs of long standing that discriminate against the products of the United States. Absolute justice is seldom realized on this earth, even in tariff matters, but we believe that the present law, with all its faults, is a step—albeit painfully slow—in that direction. The flexible clause permits—in fact, almost demands—readjustment of any harmful and iniquitous rates; and, what is to be regarded as highly important, the readjustment is to be made scientifically. The basis will be fact, studied impartially, and so far as it is humanly possible, applied and interpreted by a bipartisan commission.

FOOD INDUSTRIES doubts whether any major political party will ever again dare undertake wholesale revision of the tariff structure, for to do so would be political suicide. Given sufficient time, business can ultimately adapt itself to almost any tariff, but the cost of the process of adaptation is much too great to warrant the continual turmoil that inevitably follows a decision of the party in power to revise the prevailing rates.

What we need is something that is stable; a rate structure that is subject to change only after a thorough nonpartisan analysis. Tariff making has nearly always been political fodder, but very few politicians are either free or qualified to do the complex, economic investigation that is necessary to good national tariff revision. The flexible clause of the Hawley-Smoot tariff will offset, in time, the worst features of the law.

Human Conduct and Frozen Foods

AS time goes on, the difficulties of freezing foods properly will undoubtedly be overcome by the strict application of scientific and technical experimentation. But the difficulties of getting these foods into the saucepan of the consumer in good condition will always be more difficult. They cannot be solved by scientists or technologists—they cannot be solved by economists. After the scientists know all about correct holding temperatures, after the technologists have built a perfect refrigerator car, and truck, and cabinet, after the economists have charted cost figures and profited by the curves, there will still remain the problems of human conduct.

Recently a little boy went into a grocery store in Springfield. It was a hot day, and the boy was perspiring and red of face. Under his arm was a familiar box. It was pork sausage, the boy said. He had asked for pork chops, but when he reached home his mother had discovered the error. Whether the clerk or the boy was at fault is not the point of the incident. The point is that here, as in all such cases, the clerk made the exchange, and *he put the pork sausage back in the freezer display case.*

It matters little to the person who will eventually buy the sausages how carefully they were frozen originally, or shipped or stored. How long the youngster played ball before returning them is far more important. If the sausages thawed out before they were brought back, and then froze slowly at the temperature within the display case, they certainly were not frozen rapidly. One such box might or might not ruin a manufacturer's reputation in a household. Probably in this particular case no harm was done, yet, a "No Returns Accepted" sign is hardly a good advertisement in these days of service. And clerks—and small boys—still make mistakes.

Of course, this isn't a mighty problem. Neither is the lady who thinks frozen peas are "useless," because she refused to learn how to cook them properly, or the customer who once purchased some thawed out frozen-pack strawberries in an untidy delicatessen and now sniffs at the mention of the words "quick-frozen." But collectively they represent forces of misconception and ignorance that offer just as much difficulty to human engineering as ice crystals and display cases offer the scientist and technologist. They can be solved only by education of the public.

Another Vitamin D Process

MANY of those who are interested in incorporating vitamin D in commercially prepared foods and have been following the patent situation on the subject, have been much perplexed by the complexities involved, for not only is the scientific development of the subject quite new but also the translation of this knowledge into a rational commercialization of the science has been attended with certain difficulties.

Those who are most directly concerned, however, must be taken somewhat aback by U. S. Patent No. 1,754,434, recently issued to Josef Perino for a "Process of Manufacturing a Vegetable Alimentary Extract." Like many other patents, including the Steenbock patent, it has an apparently innocuous title; but it seems to cover all that the Steenbock patent covers, plus a few more features, the more important of which are to generate not only the vitamin D by ultraviolet irradiation but also to accompany it with some or all of the mineral salts that are necessary to proper bone formation.

What the Perino patent actually covers probably is a matter for lawyers and courts to decide, but what the Perino process will do can be determined only by competent chemists. The two views do not always coincide, and our advice to those who must make a decision on vitamin D would be to stick pretty close to the chemists and common sense. As we pointed out over a year ago, it is economically more sound for food manufacturers to sell foods than therapeutic remedies.

PACKING CITRUS FRUITS

Now a Technical Process

By EARL D. STEWART
Assistant Editor

IF FRUIT packing were merely the indiscriminate filling of shipping containers with orchard-run fruit, and if orchard-run fruit were always perfect in size, shape, color, ripeness, and shipping quality, the picking, packing, and shipping of fruit would be simple indeed. But fruits are individual living things and although groups of them may be broadly similar, no two are exactly alike. This difference makes necessary the complicated technique so well typified by the methods characteristic of present day California citrus-fruit packing practice.

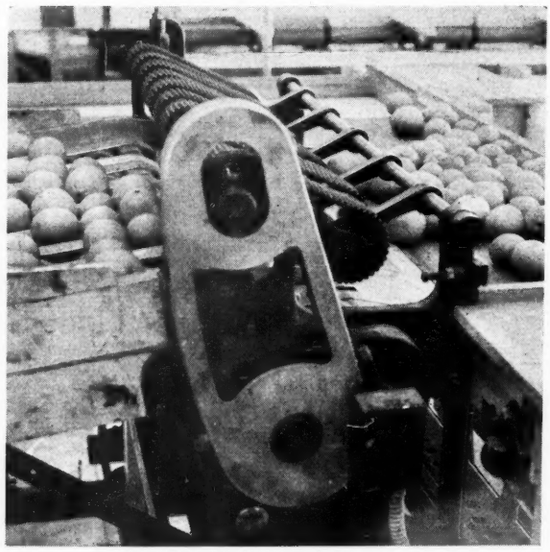


Fig. 1—Fruit stamping machine for printing trademark on fruit. The corrugated rubber belts space the fruits so that each reaches the printing wheel at the proper time

Two principal varieties of orange cultivated in California are the Washington Navel (originally known as the Bahia Navel; sometimes called the Riverside Navel) and the Valencia. The Navel, so-called from the peculiar growth at the calyx end of the fruit, is the winter orange. Its harvest begins about Nov. 15 in the central counties and moves southward, final shipments from southern California leaving around May 1. The Valencia harvest begins about June 1 and continues into November, often overlapping the Navel season. Navels are grown throughout the orange-growing districts of the state, but Valencia culture is confined mainly to the south.

Two varieties of lemons—the Eureka and the Lisbon—make up the bulk of the crop. Lemon trees bear fruit nearly the year 'round, picking and packing being carried on continuously. The yield varies, however, and the heaviest crop comes between March and May. The heaviest shipments are not made in this period, for lemons color and ripen well in storage and may be held for periods as long as three to six months, though a six-months' storage period would be unusual.

Citrus-fruit packing really begins with the picking operation, the first question to arise being that of when an orange or lemon is ripe enough to pick. Experience has shown that color is not a reliable criterion, for when tested by chemical methods oranges of equal sugar and acid content will vary widely in both degrees and evenness of color. Again, "tree-ripe" lemons are often not as high in acidity or of as good a texture as are lemons colored artificially. Evidently a compromise must be reached between ripeness and shipping quality with oranges and between size and quality with lemons.

A tree-ripe orange is a wonderful fruit but a poor shipper, and would be an uneconomical one as well, if the groves were culled for only tree-ripe fruit. Consequently, oranges are picked when the weight of total solids is eight times that of acid (citric) in the juice, and the color is 25 per cent yellow according to a standard scale. The per cent of solids is determined by a Brix hydrometer and the acid by titration. If the fruit is 75 per cent yellow the solids-acid ratio is immaterial. Fruit must have the 8:1 solids-acid ratio before artificial coloring is permitted. These standards are defined by state law. There is no legal standard for lemons.

In picking oranges the trees may be stripped of all fruit, it being all at approximately the same stage of maturity, or the grove may be searched for sizes bringing the best market price. Lemon groves must be searched for fruit of the proper size. This means that the picking cost of lemons is often much greater than for oranges. Lemons, valued for acidity and piquancy rather than for sweetness, are chosen by size. The picker holds in his hand a ring, $2\frac{6}{32}$-in., $2\frac{7}{32}$-in., or $2\frac{8}{32}$-in. inside diameter (also called Nos. 6, 7 and 8), the size depending on the locality, season, and market demand, and picks all lemons too large to go through the ring, regardless of color.

The picking equipment consists of a canvas bag, with shoulder straps and a bottom flap so fastened with snaps or buttons that the bag may be emptied without turning it upside down; a pair of clippers and, in the case of lemons, the sizing ring. The clippers resemble pruning shears in action, but the blades are shorter and have rounded tips. Clippers are used in order that the button covering

the stem end of the fruit will not be pulled off, as to do so gives entry to blue-mold spores. Care must be taken also to see that the fruit is not cut by clippers, scratched by twigs, thorns, or splintered field boxes, or bruised by rough handling. When the picker's bag is full he places it in a field box and releases the bottom flap, allowing the fruit to slide gently into the box. The field boxes are then collected by wagon or truck and taken to the packing house.

A typical packing house receives the fruit of many growers within easy hauling distance, though a very large grove belonging to one grower may have its own house. Most packing houses are co-operatively owned. Those built in recent years are frequently handsome structures of stucco and hollow tile, of Spanish Colonial architecture in keeping with the traditions of the country.

One of the greatest enemies of fruit in transit is mold, for the growth of which the moist rind and interior of the fruit offer a fertile medium. Because scratches and small abrasions are almost certain to be present by the time fruit is placed in cars for shipment, and mold spores are always present in the air, losses are high unless some methods of reducing the probability of infection, such as disinfection, oiling, and wrapping are used.

Field boxes of oranges are delivered to the packing house by truck or wagon and placed in sweat rooms if coloring is necessary. If already sufficiently colored they may be sent direct to the treating lines or stored temporarily. Gravity rolls and canvas conveyor belts are frequently used to facilitate unloading. Houses in hilly districts often take advantage of the topography, allowing the fruit boxes to flow by gravity to the storage space. Sometimes the packing house unloads its fruit on the lower level and, after treating and drying it there, elevates it to the packing floor above., thus avoiding the confusion incident to having the receiving and treating departments on the packing floor. In the sweat rooms, or temporary storage, the field boxes of each grower are stacked separately, identified as to ownership by means of a tag.

The ethylene coloring process is used almost universally. Briefly, it consists of dosing the air in the storage or sweat room with measured charges of pure ethylene, humidifying the air, and holding it at high humidity and a temperature of 80 to 90 deg. F. for several days. Fans circulate the air and the rooms are ventilated periodically. The art is still in process of development and varies in different houses in both equipment and the method used.

When the proper color has been attained the field boxes are placed on a belt conveyor that carries them to an automatic dumping machine such as that shown in Fig. 2. As they are emptied from the boxes the oranges roll down a slight incline, made of wooden or metal slats spaced about an inch apart, to remove leaves, stones, dirt, and other débris. An inclined roller conveyor receives the oranges and carries them to the first wash tank. Usually, a workman removes split or spoiled fruit before it enters the tank. Fruit that is merely dirty or dusty is washed with soap and water at about 120 deg. F. Sodium carbonate is often added to the water to reduce the quantity of soap necessary. Many plants have water softeners, the saving in soap offsetting their cost in a short time. The water in the tank is kept hot by three or four gas burners. Paddle wheels keep up a circulation in the tank and keep the fruit moving.

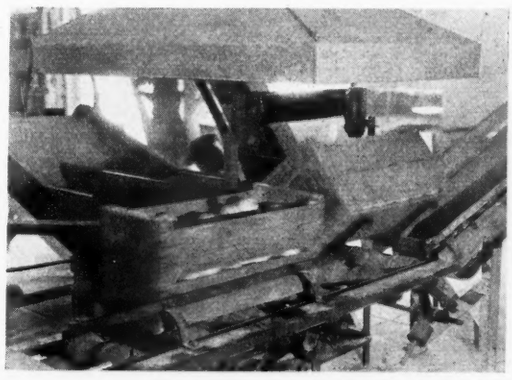


Fig. 2—Automatic dump emptying field boxes of oranges. Conveyor to right carries boxes to loading platform outside

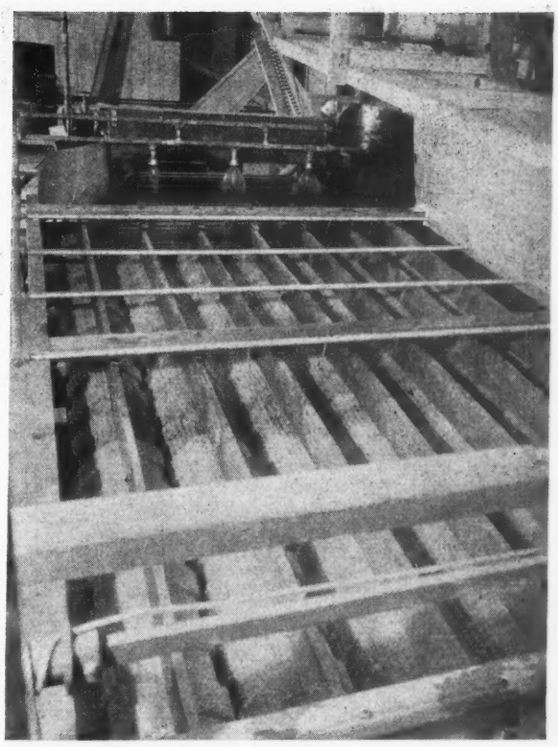


Fig. 3—Inclined rotary scrubbing brushes which clean the oranges as they roll down the incline under a spray of water

During cold weather, when the orchard heaters have been burning, the fruit is often more or less coated with an oily, adherent soot. To aid in removing this coating, kerosene emulsion is added to the wash tank. From the first wash tank the fruit is elevated on a roller conveyor to a set of inclined revolving brushes about 8 ft. long. Seven brushes make six channels down which the fruit travels under a spray of clean water, being vigorously scrubbed as it moves along (Fig. 3).

After the scrubbing operation the fruit enters a second tank, where it is soaked in a solution of borax or sodium hypochlorite as a prophylactic against mold spores. Then it is again sprayed with clean water and dried. The fruit is first wiped by a conveyor of Turkish toweling on rollers so spaced that the fruit rolls about as it passes over the conveyor. This part of the drying equipment is omitted in many houses. In Fig. 4 the long roller elevator carries the fruit to a horizontal canvas conveyor leading to the dryer, which consists of a horizontal roller or metal mesh conveyor about 40 ft. long moving at

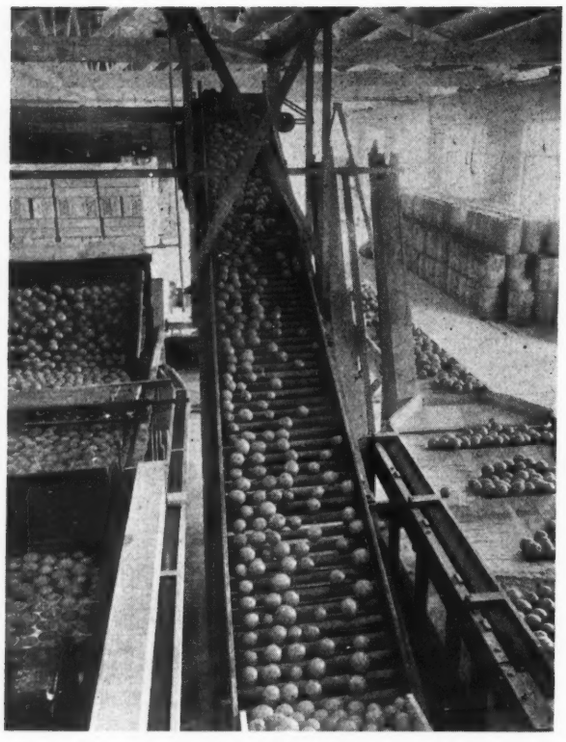


Fig. 4—Soaking tank, towel dryer and fruit elevator to air dryer

about 9 or 10 ft. a minute. At intervals a hoodlike structure (Fig. 5) is built over the conveyor and a fan placed at the hood opening. There may be five or more hoods, each with a fan mounted on a shaft common to all of them and driven by one motor. The fans deliver a gentle current of unheated air over the fruit and through the rollers. When the fruit reaches the end it is quite dry and cool. The dryer is not always overhead; it may be placed wherever convenient.

IN the next step the fruit receives the wax coating and is highly polished. The Brogdex process, developed by Brogden and Trowbridge, is mostly commonly used. Dry fruit moves by a canvas conveyor to an electrically heated chamber, into which is sprayed a mist or fog of hot oil or a solution of paraffin in oil. The fog of oil deposits on the cool fruit, the coating being evenly distributed and the fruit polished by rotating brushes made of hair. From the oil treatment the fruit passes to sorting belts, where it is graded for quality. Three grades are recognized, two shipping grades and culls. The three grades are placed on appropriate conveyor belts; the culls go to the cull bin, where they are measured and checked against the particular lot from which they came. First quality fruit usually is marked with a distinctive trademark in indelible ink by a stamping machine through which it rolls (Fig. 1). The "Sunkist" mark of the California Fruit Growers' Exchange, the "Pure Gold" mark of the Mutual Orange Distributors, and the "Blue Goose" mark of the American Fruit Growers are examples. Second quality fruit usually is not stamped. Conveyors carry the stamped fruit to the size grader.

An orange sizer (Fig. 6) utilizes a series of wooden rollers placed end to end and revolving upward. The space between the roller and the central frame can be varied. Along the frame opposite the rollers there runs a smooth rope that carries the fruit down the slot formed by the rollers and the frame. The revolving rollers turn the fruit as it moves along. When the orange reaches a place in the slot equal to its diameter it drops through, the smallest fruit dropping first. Once past the sizing slot, the orange rolls down a runway past the star wheel of the counting machine—if one is used—and into a canvas-bottomed bin, from which it is taken to be wrapped and packed into the shipping boxes.

Ten sizes of oranges are recognized, according to the number required to fill a standard orange box (defined by state law), which is $11\frac{1}{2}$x$11\frac{1}{2}$ in. inside by 26 in. outside. The sizes are 80, 100, 126, 150, 176, 200, 216, 252, 288, 344. The largest size, 80's, are $3\frac{1}{2}$ in. in diameter, each smaller size indicating $\frac{1}{8}$-in. decrease in diameter. The sizes depend on such cultural practices as amount of fertilizer and irrigation and, to some extent, the prevalence or severity of diseases and insect pests. During the seasons of 1926 to 1929 the average sizes of Navel oranges shipped by the California Fruit Growers' Exchange (about 75 per cent of the California crop) were 191.9, 181.8, 182.4, and 230.7. For Valencias the corresponding sizes were 207.3, 230.8, 208.1, and 249.9. From these figures it is seen that the Valencias average smaller than the Navels, season for season.

The figures given in Table I show the variation in sizes of Navels during the present season in lots from three different growers received at one packing house. As a rule, medium sizes bring the highest price per box, with the result that the growers of the second and third lots given in the table would get the best returns per box for their fruit.

Packing citrus fruit is a hand operation requiring considerable skill and dexterity. Each fruit is inclosed in a tissue wrap appropriately colored (pink for oranges, yellow green for lemons) and printed. The packing box is held at an angle on a small, low table mounted on casters for ease in moving. The hod containing the wraps is placed at the left side of the box. The packer, who wears white cotton gloves to prevent injuring the fruit with her finger nails, grasps a wrap with her left hand and an orange with her right. With a rapid movement, difficult to follow with the eye, she transfers the orange to the left hand and squeezes the wrap around it. The loose ends are seized in the right hand and twisted. The wrapped orange is then placed in the box. As the box fills, a crown is built up in the middle of each half, so that when the lid is nailed on and the center binding strap fastened tight, a firm but resilient

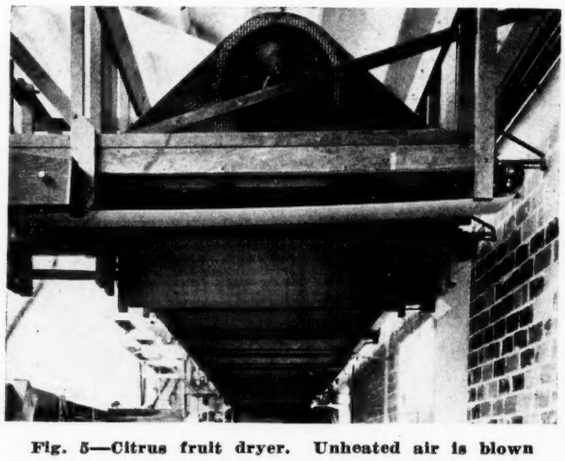


Fig. 5—Citrus fruit dryer. Unheated air is blown over the fruit by a series of fans mounted in hoods. One of the fans is shown.

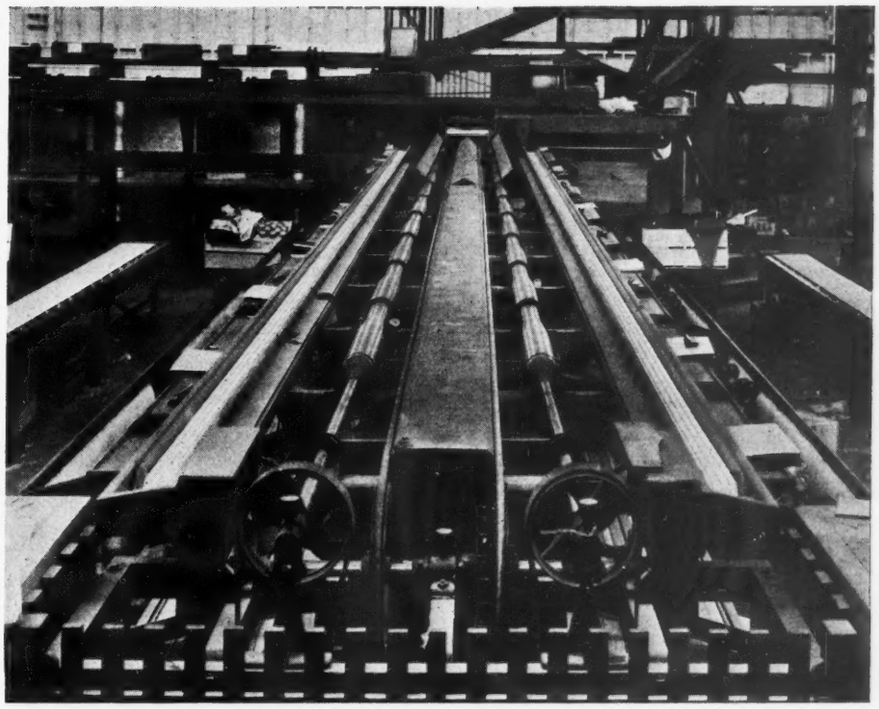


Fig. 6—An orange sizer over bins for sized fruit. Conveyors for removing filled boxes at right and left

box results, one that will accommodate itself to any shrinkage of the fruit during shipping or storage. A well-packed box of oranges should be solid and well crowned; the fruit should be properly aligned, as it must be to get the proper quantity in a box; the rows of fruit on the top and bottom layers and at the cracks should be tightly wrapped and the printing faced to improve appearance and to avoid the protrusion of loose ends; wraps should not be so tight as to split the paper; and the size stamp on the top-center of the label end should be clear.

As a rule, packers receive 5½ to 7½c. a box, depending on the size of fruit packed and in some cases on the quality of the pack. Expert packers will pack from 50 to 100 boxes in 8 hours, 75 being a fair average. The usual practice is to move the packers from the size they are working on, to the next size larger every half hour or so. This avoids disputes about most favorable positions and gives each packer a chance at the best paying sizes. When the packer finishes a box she places a card bearing her number between the rows of fruit in the top layer and tranfers the box to a canvas belt conveyor that carries it to the nailing machine. The nailing machine operator removes and files the card, nails down the top and attaches the center binding strap, most houses using automatic nailing and binding machines. The box then moves by roller conveyor to a trucker, who places it in a waiting refrigerator car. A tally is kept of the number of boxes of each quality and size, and this record becomes the basis of sale when the car reaches the Eastern markets. A carload is the usual selling unit and contains 462 boxes of oranges or grapefruit or 348 boxes of lemons.

An important problem confronting all packing houses is the crediting of each grower for the fruit received from him. Efficient and economical operation renders impossible separate packing of each grower's fruit, yet each grower must be paid in proportion to the yield of his crop in packed boxes. Formerly it was customary to weigh the fruit as it was received, separate and weigh the culls, and from the remainder estimate the weight of packed fruit and number of boxes. Another way was to tally the actual yield of packed boxes from each lot received and when the entire lot was in the bins to estimate the number of boxes still unpacked. At the end of the day, estimates were balanced against the actual pack and necessary adjustments made.

A great many houses use the Scheu fruit counter. As the fruit drops through the sizer it runs down a channel and under a star wheel (Fig. 7) that makes an electrical contact and operates a magnetic counter, located in any convenient place. As the last of the fruit in each lot passes the sizer the counters are read and turned back to zero ready for the next lot. The figures given in the foregoing table are taken from the counter records of the Sanger Citrus Association, Sanger, Calif. Where the counter system is used growers are paid according to the quantity of each size they deliver.

THE packing of lemons differs from that of oranges in several ways. Lemons are received and washed in much the same way as oranges, though, because of the shape of the lemon, the washer is different. The lemons are emptied into a tank of soapy water and moved along by heavy canvas flaps dipping into the tank and carried on wooden bars attached to a chain driven by sprocket wheels at each end of the tank. The lemons pass from the first soak around a curve in the end of the tank into the turbine washer (Fig. 8). This consists of a circular tank containing a vertical, motor-driven paddle wheel to maintain a rapid circular motion of the wash water. Metal guides steer the lemons under a series of brushes suspended by small chains and completely encircling the tank. Brushes are placed also on the inside

Table I—Variation in Size of Navel Oranges From Three Growers

		Size								
		80	100	126	150	176	200	216	252	288	344
1	Total 1,977—1st quality	...	...	4	12	35	31	263	344	532	756
	Total 310—2d quality	...	...	....	....	3	8	22	38	91	147
	Grand total 2,287. Culls, 1 field box.										
2	Total 9,345—1st quality	326	837	2,523	2,249	1,975	466	745	142	68	14
	Total 2,711—2d quality	23	39	239	266	541	437	552	271	246	97
	Grand total 12,056. Culls, 5 field boxes.										
3	Total 49,861—1st quality	117	55	570	5,696	12,991	4,249	10,876	5,261	4,656	1,790
	Total 9,904—2d quality	11	8	171	315	1,074	832	1,703	2,061	2,295	1,404
	Grand total 59,765. Culls, 21 field boxes.										

of the guides. Usually, there are two of these brush-lined channels around which the fruit is carried by the rotating water. At the end the scrubbed fruit is carried by the moving water to a roller elevator that takes it under a spray of clean water to a rubber and canvas sorting belt. Here it is sorted for color and quality. Usually three colors are recognized—green, silver, and yellow. Yellow fruit is ready to pack; the others are taken to the sweat rooms for coloring or to storage rooms to await more favorable markets. To lessen shrinkage while in storage, the fruit is not dried.

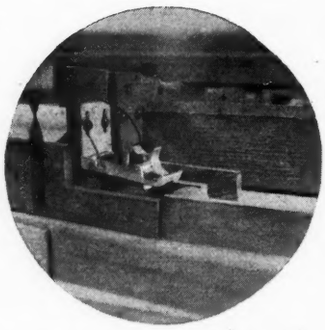


Fig. 7 — Star wheel making contact, which operates a counter as the orange passes under it

Ample storage space is a necessity for a lemon-packing house, as fruit frequently is kept several months. Refrigeration is not necessary, though it is desirable to have the storage rooms well ventilated and cool. In this respect the new Escondido Lemon Association Plant utilizes the cool nights in its locality to advantage. The storage room is well insulated and has a series of heavy refrigerator-like doors opening along two sides of the building in the direction of the prevailing winds. At night these doors are opened, the temperature of the room soon cooling to that of the outside air. Early in the morning the doors are closed and the room remains cool for the rest of the day. When properly colored, the fruit is ready to pack. It is first given an oil coating in a machine similar to the one used for oranges, but modified to suit the shape and non-rolling quality of lemons, and then sent to the packing lines.

Until very recently lemons were sized by eye as they were packed. A sizing machine has been developed, but it is still more or less experimental and not in universal use, as is the orange sizing machine. It consists of a pair of canvas belts forming a V-shaped slot that can be varied in width at the bottom. Lemons are placed in the slot in such fashion that they travel lengthwise, dropping through when the width of the slot becomes equal to the diameter of the fruit. To make sure that the fruit travels lengthwise a short strip of stiff canvas is so placed that the lemons must go beneath it at the outset. This tends to straighten them out, but some persist in riding the grader crosswise. Consequently the sizing is not perfect, but probably is as accurate as when done by eye. When a sizer is not used packing is done either from trays or from belts. In the former method which is the older and is gradually becoming obsolete, the lemons are placed on trays about 2x3 ft. x 2 in. deep. When the packer has selected from the tray the size she is packing, it is taken to the packer of the next size, and so on.

In most packing houses lemons are dumped on slow-moving belts, usually four, arranged in a series with the fastest first. Thus, in one house the belts are 24 in. wide, and in lengths and speeds as follows: No. 1, 11 ft. long—speed, 13 ft. per minute; No. 2, 24 ft. long—speed, 9 ft. per minute; No. 3, 14 ft. long—speed, 3 ft. per minute; No. 4, 9 ft. long—speed, 1½ ft. per minute. A return belt sometimes carries lemons from the last belt back to the start again, the value of which has been disputed with the result that many houses do not have it. Usually lemons remaining at the end of the line are unsuitable for packing and should be so regarded. The different lengths and speeds are adapted to the different proportions of the various sizes, lemons usually running heavy in the smaller sizes. The packer selects the size she is packing from the fruit as it moves past her and packs it in much the same way as oranges are packed (Fig. 9).

The sizes of lemons are 180, 210, 240, 270, 300, 360, 432, 490, and 540 to the standard lemon box, which is 10x13 in. inside by 27 in. outside. Packers are paid by the box but at a higher rate than is used with oranges. As each fruit must be selected, a packer cannot pack as many boxes daily of lemons as of oranges. When packing from trays one house requires beginners to pack 22 to 24 boxes a day in one month and 27 a day in two months. From belts, more output is the rule, experienced packers turning out 40 to 75 boxes a day, with 50 as an average. Not everyone has a sufficiently accurate eye for size to learn lemon packing, many who try it giving it up after a few days.

After seasons of heavy frost, the separation of frozen from unfrozen fruit is a problem occasionally confronting the packing house. Thomas, Young, and Smith (Bull. 304, California Agricultural Experiment Station, January, 1919) studied the effects of freezing on citrus

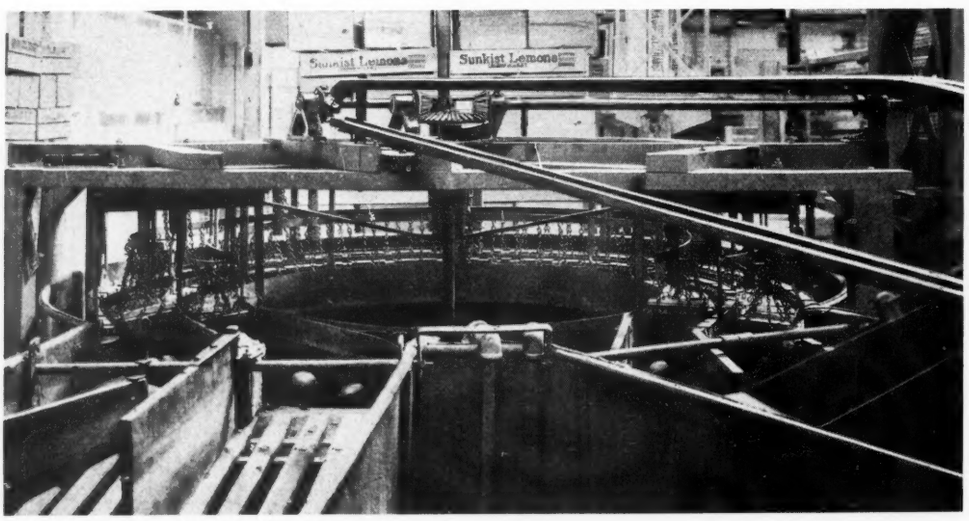
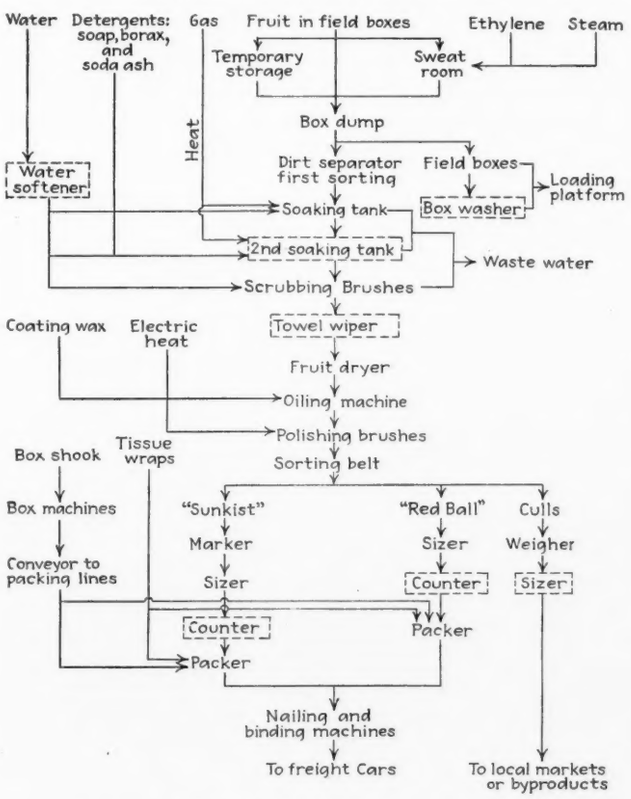


Fig. 8 — A lemon washer. Because of their irregular shape, lemons must be forced through the wash-water. A vertical paddle wheel causes the water to rotate and carries the fruit along with it

Fig. 9—Lemon packing from belts. Sizing by eye

fruit and found that the difference in specific gravity might be relied on for separation, frozen fruit having a lower specific gravity than unfrozen. Other differences make frozen fruit unsuitable for food; the skin is spotted, the interior tissue broken down, cavities develop between juice sacs and segments, and white spots of hesperidin crystals appear. After a short period of storage, the fruit, particularly lemons, develop a particularly loathsome appearance, being covered with soft, slimy, white spots. The California law forbids the sale or shipment of fruit showing more than 15 per cent of frost injury, and because not all fruit in a grove will be frosted during a freeze, salvage operations are worth while.

In modern frost separators the fruit is dropped into a stream of flowing water. Unfrozen fruit sinks further into the stream and does not bob up so quickly as the frozen fruit. Consequently it is carried under water for a greater distance, and if a screen is placed at the proper place the frozen fruit will be carried off above the screen and the unfrozen fruit beneath it. The method suffices for a commercial separation, though it is not absolute. The difference in specific gravity is not a constant amount, some frozen fruit showing very little decrease. Because of their irregular shape, lemons cannot be treated in this way, but their appearance when frozen is so characteristic that experienced workers can readily identify them.



Equipment surrounded by dotted lines is frequently omitted

Fig. 10—Flow sheet for citrus fruit packing

The California Citrus League has compiled cost figures for the production of oranges and lemons during 1927 and 1928, a condensation of which appears in the following table. The figures (except yield) are in dollars per packed box.

	Oranges			
	1927		1928	
Yield in boxes per acre	204.1		169.9	
Cultural cost		1.265		1.637
Handling cost				
Picking	0.127		0.124	
Hauling	0.046		0.047	
Packing	0.556		0.576	
Total handling		0.729		0.747
Advertising and selling		0.118		0.132
Total f.o.b. cost		2.112		2.516

	Lemons			
	1927		1928	
Yield in boxes per acre	178.7		162.8	
Cultural cost		1.391		1.72
Handling cost				
Picking	0.337		0.391	
Hauling	0.062		0.057	
Packing	0.898		0.850	
Total handling		1.297		1.298
Advertising and selling		0.149		0.188
Total f.o.b. cost		2.837		3.212

The higher cost of handling lemons, of course, is due to the slower rate of picking and packing, the picking cost being about three times that for oranges and the packing cost about one and a half times the packing cost of oranges.

Acknowledgments are gratefully made to R. J. Senior, manager of the Sanger Citrus Association, Sanger, Calif., for the counting machine records and photographs; to the Citrus Machinery Company, San Francisco, for photographs; and to H. J. Ramsey, field manager of the California Fruit Growers' Exchange, for the cost figures of orange and lemon production.

Ridding the Plant of

RATS

By C. V. AKIN
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Washington, D. C.

The Rat—man's most dangerous and expensive charity. To feed him costs the United States $200,000,000 a year. To provide the animal with packages of produce to deface, buildings to cut and mar, and surplus materials to foul, costs the nation an additional $300,000,000 annually. The total figure would buy food for the present United States Army, at the 1928 cost, for more than twenty years.

HEALTH authorities and economists regard the rat as the most dangerous and expensive of the animal pests living at man's expense. Strangely enough, the business interests that suffer most from the depredations of these semi-savage "house guests" seem least aware of the price they pay for the privilege of running rat sanctuaries, or, in any event, they do the least to rid themselves of the financial burden of housing and feeding the ever increasing millions of rats.

If a conservative estimate of one rat per capita of human population be applied, the annual meal ticket for rats in the United States will just about use up a $200,000,000 bond issue. Add to this the "cover charge" for wanton destruction of property consequent on gnawing and slashing, plus the "tip" for spoiled food products due to fouling, and it will be understood that giving rats a good time costs the United States the best part of one half billion dollars per annum. This overwhelming figure is better grasped if we consider it as an unconstitutional per-capita tax of over $4 per annum for every man, woman, and child living within our borders. The significant point in this proposition, however, is the fact that losses due to rats are not equably prorated on a per-capita basis but are compounded and pyramided for the big property owner and the manufacturer and producer of edible and destructible merchandise.

Of all mammals, the rat is the most cosmopolitan. None other is so well represented numerically in the countries in which he has made himself at home. Because this animal can adapt itself to almost any environment dominated by man and, further, because the rat can out-think, outclimb, outjump and breed faster than most animals, including man, it has survived man's spasmodic efforts at control. If all the coverts and hiding places were suddenly obliterated, man would be astounded to find himself ringed about on all sides with rats. The good folk of Hamelin Town must have got something of the same sort of shock when the Pied Piper got the local rat population all strung out in one long line. The rat wisely chooses to live near humans who give him shelter and food, and no doubt will continue to do so as long as he is permitted or indirectly encouraged.

To combat rats successfully knowledge must be had of the habits and special abilities that make this animal such a formidable sanitary and economic menace. From the standpoint of distribution within a building, rats fall into two classes:

Brown Rat—The brown (Norway) rat keeps mainly to the lower floors and basements of buildings, as it lacks the ability to climb that is developed so remarkably in the roof rat and black rat. The brown rat is essentially a burrowing animal and by preference lives and breeds in excavations. It will burrow into the ground to nest when it already has sufficient covert beneath floors to insure protection. Generally, the burrows extend from ½ to 1 ft. in depth, but rats have been known to excavate beneath walls 2 ft. deep. With the greatest ease the brown rat burrows into the hardest soil, such as well-packed clay. This rat has a well-developed gnawing mechanism, against which few materials are proof. It has been known to perforate walls constructed of sun-dried brick laid in sand and lime mortar, in one instance gnawing through the body of the brick, but more frequently going through the wide interstices filled with mortar. Cases have been noted in which a rat has been able to gnaw a hole in slate, and lead pipes are often perforated by its attack. Solid wooden beams, interrupting a favorite rat run, have been seen notched by the rat to a depth of 2 or 3 in. to permit its more comfortable passage. In swampy regions, the brown rat has adapted itself to semi-aquatic habits and, when put to the test, has been known to swim half a mile in the open water of a bay. The brown rat will eat anything, without regard to its degree of freshness or decay.

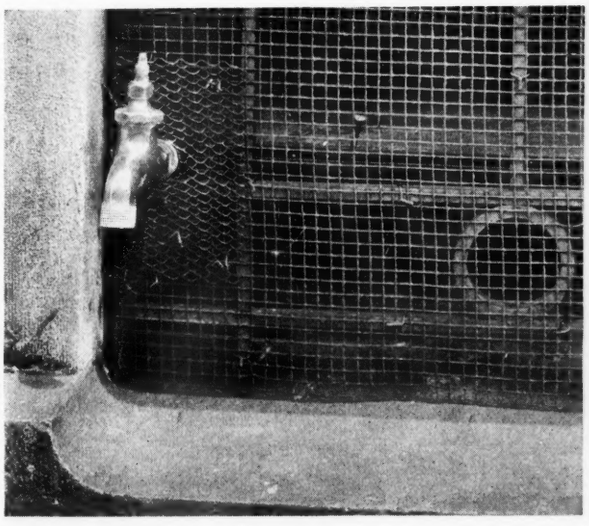
Roof Rats and Black Rats—Unlike the brown rat, the black rat and roof rat are superior climbers and jumpers. The black rat ordinarily does not burrow, but lives in hollow walls, garrets, or loose material, such as empty boxes, barrels, or any rubbish, and within buildings frequents the upper stories and roof, away from its enemy, the brown rat. It climbs pipes, wires, and exposed uprights with the greatest facility. The smutty crescents made by these rats on exposed beams just beneath the roofs of buildings are striking evidence of their activity and extreme agility. These marks come from grease and dirt on the rat's fur as he swings under the joists where they cross the beams. These rats can run and play on an uninsulated telephone wire as easily as a person walks across a level floor, and with as perfect balance. An empty metal can 2 ft. in depth is not sufficient to retain the black rat. Both black rats and roof rats are cleanly in their habits and prefer grain and clean, fresh food. The dietary preferences of these rats should, therefore, be considered in the selection of bait when trapping is undertaken.

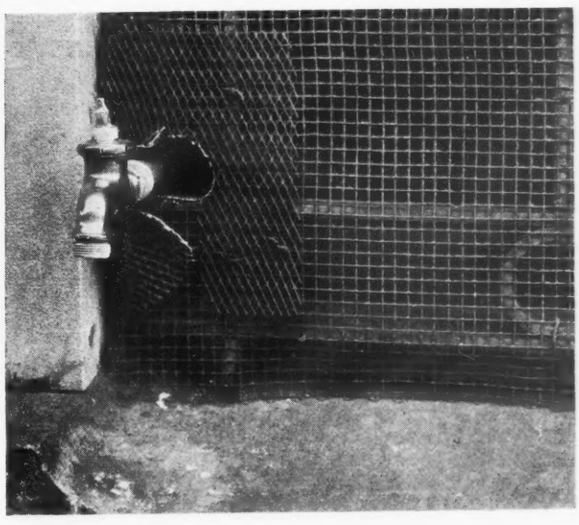
Rats are strictly nocturnal in their habits and can see better at night. When traveling in the daytime, the rat seems uncertain of its movements, unless running along a wall, where its long vibrissae, or whiskers, apparently are of service in guiding it. The black rat is even more wary than the brown rat and is, consequently, more difficult to trap. It is rather exceptional to catch a black rat in a cage trap, snap traps and dead falls being more reliable for capturing this species.

Rats are great travelers. Extensive migrations of rats have frequently been noted, and a seasonal movement of rats from houses and barns to open fields in the spring, in search of fresh, green food, is recognized as a regular occurrence. The return movement takes place in autumn. From a number of trapped rats released in a large city, one was recaptured, two days later, at a point a mile distant from the place of liberation; and several were retaken, in the course of two weeks, 2 and 3 miles from the place of release. Their travel had been through a thickly populated area of the city and across city streets, some of which were heavily traveled thoroughfares. Rats are not infrequently found in freight cars, and nearly every ship entering United States ports harbors a number of them unless artificial means have been taken to eliminate these undesirable stowaways. Occasionally, the number of rats taken from one ship by fumigation and trapping has amounted to several hundred.*

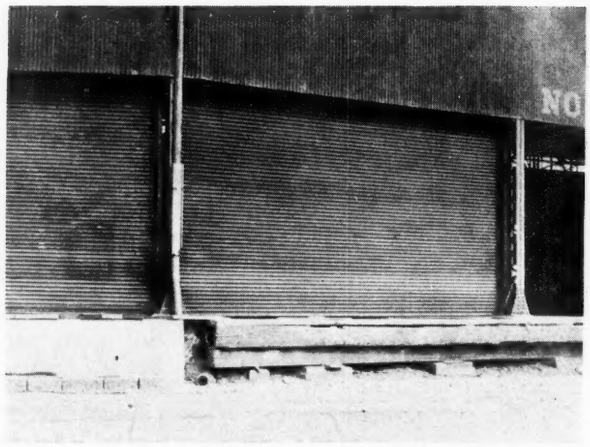
As applied to a community rat population, the term *eradication* may not be used with exactness. Rats may be eliminated from a building or collection of buildings, or from a vessel or fleet of vessels, and this applies to any structure that can be made secure against the ingress of rats; but, as the rat population diminishes beyond a certain point, the survival of the remainder becomes progressively easier and control correspondingly more difficult. So, after all, our aim is to curb rather than to get rid of all rats. For all practical purposes, one may suggest that efforts be directed at suppression and control as representing the limit to which an anti-rat campaign may be prosecuted within economic bounds. The following procedures are offered as affording the best prospect of effectively

*Public Health Bulletin No. 180, "The Rat."





Screening openings against rats. The screen is 12-gage wire and ½-in. mesh. At the left is shown the correct method for protection around pipes. The right-hand view shows faulty construction, allowing free entry of rats when careful attention is not given to small openings



Rat-proof wharf construction is shown in the left-hand illustration. Uninterrupted concrete wall on land side, made tight to wharf flooring, prevents rats from leaving the ship by the water route and finding a refuge after swimming ashore. The picture on the right shows a wall that is defective on the land side

ridding a plant of rats and of keeping it free from these pests.

Steps in Rat Suppression and Control

1. *Eliminate rat-hiding and harboring places from ground area of premises.* This means to clean up and keep clean. Indispensable collections of lumber, equipment, and miscellaneous assortments of material may be protected against rats by piling in an orderly manner on elevated supports, giving at least 18 in. of clearance above the ground. This principle of orderly stacking and elevation may be practiced to advantage within warehouse and storage structures and, in addition, facilitates trapping and fumigation where these measures are indicated.

2. *Prevent ingress of rats to structures where food products are stored.* The surrounding walls of such buildings should be of brick, concrete, or other material impervious to rats. All accidental openings, such as holes for pipes or conduits, must be filled with cement mortar in such fashion as to block completely the space between pipes and wall material. Such precautions must be observed also where piping passes through division walls and through floors. To close these holes interrupts the free running of rats from one part of the building to another. Doors must fit tightly and, if of wood, should be protected at the bottom edge and corners with metal flashing extending upward 1 ft. from the threshold. If the threshold is worn, it must be repaired. Basement or ground-level windows and ventilator openings should be protected with $\frac{1}{2}$-in. mesh wire screening of 12 gage. Metal doors must fit tightly.

3. *Prevent harboring of rats within the building.* Two phases of rat-hiding must be considered. The first is temporary shelter, hurriedly taken to escape attack. Such refuge may not be eliminated where materials are stored but it may be reduced by orderly stacking, with elevation, as previously suggested. The second, and vastly more important consideration, is the secure harbor sought by the pregnant female rat for nesting purposes, the female brown, or Norway, rat—a poor climber—preferring to nest beneath ground-floor surfaces.

Floor areas should be of dependable concrete and must be unbroken throughout the entire extent of the covered area. Floor edges must be joined tightly to walls of rat-impervious materials and outside walls must extend at least 2 ft. below ground level to protect against rat burrowing. Drain openings in such floors must be protected with strong metal screen in which the openings do not exceed $\frac{1}{2}$ in. Where offices or special storerooms of frame construction are located within an otherwise "ratproof" factory or warehouse, wooden floors should be laid directly on the concrete or on runners not exceeding $\frac{1}{2}$ in. in thickness. Double-frame walls must be avoided and double ceilings eliminated. The open air "mill type" of construction must be adhered to in all floors above the ground floor. If dust is a hazard, light tongue-and-groove flooring may be laid over the heavy, open-joint, wooden floor. Reinforced concrete floors are, of course, to be recommended in new factory construction. The principle of "ratproofing" to be strictly observed is to *eliminate inclosed spaces wherever present.*

4. *Control the rat's food supply.* Obviously it is impossible to eliminate supplies of rat food in a food manufacturing or processing establishment, but attention to certain details will repay the effort. Bulk foods and the waste particles from broken packages are the principal sources of the rat's provender. Rigorous cleaning of floors will remove waste, and open lots should be kept in metal-lined rooms or bins. Especially attractive foods may be kept in lots on floor areas protected by screening with 12 gage, $\frac{1}{2}$-in. mesh. Large storage rooms may, in this manner, be constructed at little cost.

5. *Elimination of Rats Already Resident in a Building or That May Enter From Time to Time. (a) Trapping* —It is worth the time of any plant executive to apply himself studiously to the problem of rat eradication, and money spent for this purpose will be well spent. Constant trapping by trained trappers recruited among plant employees is to be recommended as the most efficient and specific supplementary rat eradicative measure. Both snap traps and cage traps should be used, the former for routine trapping and the latter in the larger storage compartments, where there is little produce turnover. The secrets of successful trapping are based on knowledge of the rat's habits. The trapper must out-think the rat, which, through countless generations, has built up an admirable defense mechanism.

The trapper's first duty is to survey the structure of the plant he traps. He looks for evidences of rat occupancy, such as well-marked runways, rat cuts, droppings, and the like. Through these signs he gains knowledge of the degree of infestation and of the places where rats run and hide. He may then proceed to trap with

certainty. Careful selection of traps and of bait and the intelligent placing of traps with reference to rat runs result, promptly, in a reduction of the rat population. Most trapping efforts fail because too soon discontinued. Trapping must be constantly undertaken to prove most effective, and failure to catch rats is no indication to cease. The plant superintendent measures the effectiveness of the operation by the reduction in the extent of destruction noted. If the trapper produces no rats and destruction continues, the trapping is being improperly done. The next move is to change trappers and not to discontinue trapping.

(*b*) *Fumigation*—As a means of simultaneously ridding all parts of a plant of rats, adequate fumigation with hydrocyanic acid gas cannot be too strongly recommended. The fact that this gas does not affect food products in any way is greatly in its favor. Because of the extreme danger to human life, the gas must be applied only under the immediate supervision of an experienced plant official who is responsible for the safety of fumigators and public alike. At the time of fumigation, every plant employee not directly engaged in fumigation should be accounted for and made to leave the premises. Whenever possible, fumigation should be undertaken at night or on a holiday, which provides the maximum of exposure to gas and sufficient time to clear buildings of fumes with minimum danger to life and minimum loss of plant time. The use of a warning gas in conjunction with hydrocyanic acid gas is an essential safeguard. Satisfactory warning is produced by one of the lacrimatory gases, of which chloropicrin and cyanogen chloride (HCN-CNCl) mixtures are examples.

A full-grown Norway or wharf rat caught in an "official" type snap or dead-fall trap

Two methods of applying hydrocyanic acid gas are in more or less general use by official agencies:

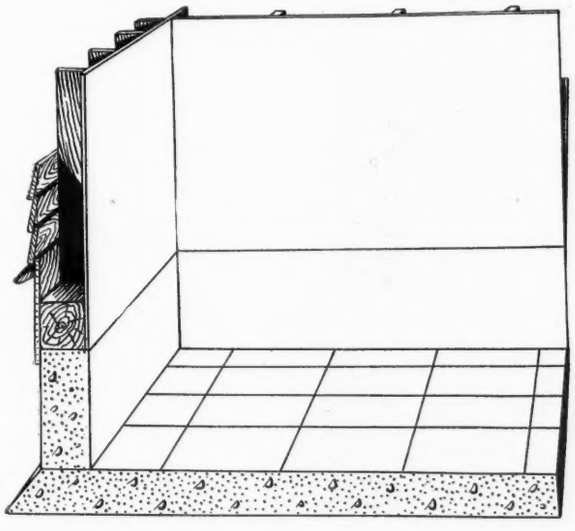
Barrel generation method—The cyanogen chloride gas mixture is produced by the following formula in sufficient concentration to kill rats:

Sodium Cyanide (broken egg-cyanide)	4 oz.
Sodium Chlorate (crystals)	3 oz.
Hydrochloric Acid (Comm. Baumé 20 deg.)	17 oz.
Water	17 oz.

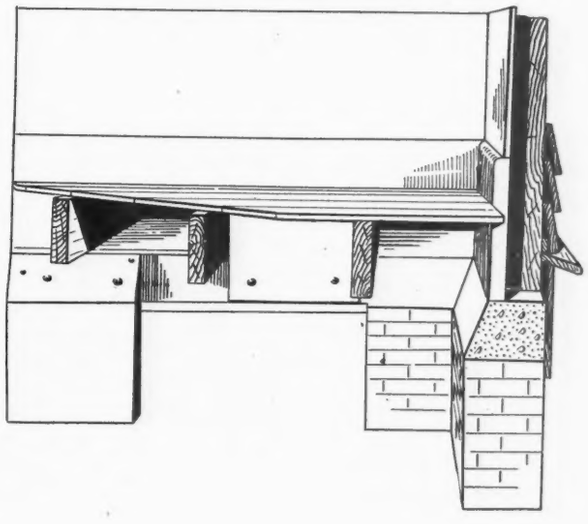
The foregoing is for 1,000 cu.ft. of air space, the required exposure being 2 hours. Longer fumigation is advantageous, as more complete diffusion and penetration of the gas are insured. Hydrochloric acid and water are mixed in crocks or barrels, the size of container depending on dosage of cubic area to be treated, and the chemicals are added to the acid-water mixture after all other preparations for fumigation are completed.

Zyklon-B, the trade name given to a chemical preparation of German manufacture, is composed of liquid hydrocyanic acid absorbed in a porous, granulated, earthy substance, called diatomite. A warning gas is added which, through its "tear" effect, prevents the accidental entry of a compartment under fumigation, and the persistence of which, after fumigated compartments have been opened up for ventilation, is further guarantee against the unauthorized entry of the compartments until dangerous concentrations of hydrocyanic acid gas have been eliminated. This preparation is distributed in hermetically sealed tins containing approximately 1, 4, 16, and 48 oz. of hydrocyanic acid, by weight. By this means the dosing of cubic areas in units of 1,000 cu.ft., or multiples thereof, is rendered easy. Cans are opened with special implements by fumigators wearing anti-cyanide gas masks, and the diatomite carrying HCN is poured on canvas or paper sheets laid on compartment floors. In a very short time the entire HCN gas content of the diatomite is given off, which insures maximum gas concentration of the cubic air space with but little delay.

A form of rat-proof wall construction. Concrete or brick laid in cement mortar rises from an unbroken floor to a point 1 ft. above the floor, thus raising the hollow frame construction to a point above which rats can reach for gnawing



Rat-proof construction details applied to elevated frame structure. The metal flashing of the box between sill and floor and between floor joists is applicable to any similar boxing at upper floor levels



At the close of fumigation, the inert diatomite is removed and destroyed.

Special advantages of Zyklon-B are its efficiency, compactness, safety of storage and transportation, and its cost. For details of its merits as compared to other cyanogen preparations, the reader is referred to Public Health Reports, Vol. 43, No. 41, Oct. 12, 1928, a copy of which may be secured from the Surgeon General, U. S. Public Health Service, Washington, D. C.

For effective and safe rodent fumigation with HCN, certain precautions must be observed. These may be summarized as follows: the official in charge of fumigation must know the structural details of his plant, the probable location of rats, the fumigant used, and what to expect of it; every employee of the plant must be advised of the danger attending fumigation; every plant employee assigned to fumigation must be carefully instructed by the plant's technical expert who is to have charge of fumigation; each fumigator should be equipped with an anti-cyanide gas mask, with canister specially prepared to neutralize the warning gas used, as well. (The Chemical Warfare Section, U. S. Army, is the authority on anti-cyanide gas masks.)

Liquid hydrocyanic acid gas, with or without added warning gas, is supplied in 75 lb. (I. C. C. test) cylinders by several chemical firms. These preparations are ideal if considered from the standpoint of fumigation efficiency alone. They are mentioned, however, only to point out the danger and the mechanical difficulties attending their use.

The explosion hazard connected with the use of carbon disulphide (CS_2) and the destructive and corrosive action of sulphur dioxide (SO_2) preclude the use of either as a fumigant except in special cases where they are indicated. Neither is recommended as an agent for rat suppression in buildings where food products are processed or manufactured.

(*c*) *Poisoning*—The use of poisoned baits, the active ingredient of which may be phosphorus, arsenic, strychnine, barium carbonate, or other recognized rat poisons, may be recommended under certain circumstances, but cannot be generally indorsed for the food products industry.

There is, after all, no single road to rat eradication. A brief consideration of the major factors involved will indicate the importance of attacking from several points, simultaneously:

The rat is a prolific breeder and keeps ahead of routine combat measures. The breeding female requires food and security to produce frequent, large litters; so, if she be deprived of safe harborage and an abundance of food, the birth rate is specifically reduced.

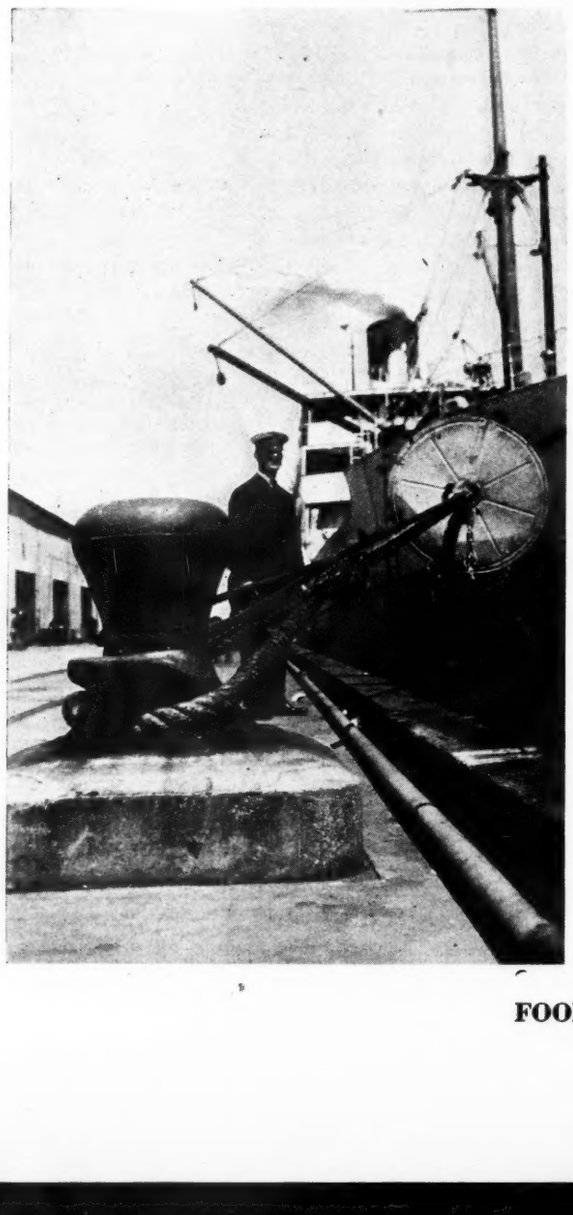
If no effort is made to control the rat's natural food supply, the results of trapping will be unsatisfactory.

Neither trapping nor fumigation is fully effective in a building which affords secure harboring places within and, at the same time, may be entered and left at the rat's pleasure.

The complete "rat proofing" of a building will not serve to eliminate an existing rat population so long as general supplies of food and water are available within.

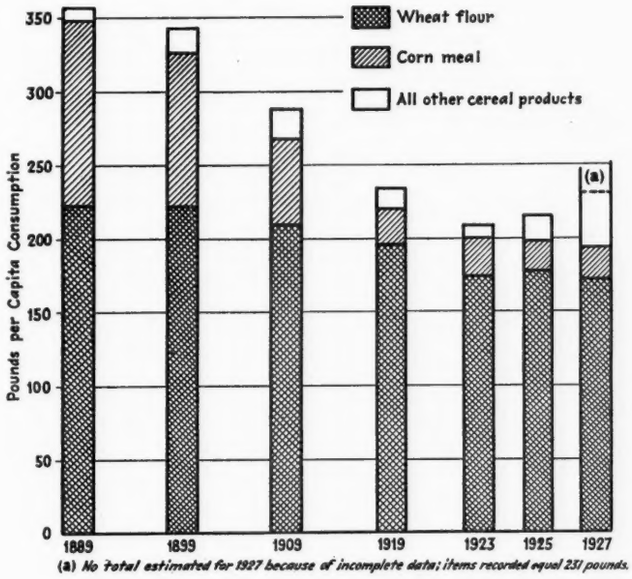
The rat has no chance for survival in a building that provides limited temporary harborage, no well-concealed inclosed spaces for nesting, restricted food and water supplies, and where the occupants continually attack with traps, fumigants and poison baits. To solve the problem of rat eradication, it remains for the business interests to determine whether or not it costs more to eliminate rats or to feed them and to provide buildings and products that they may deface and despoil.

Rat guard on ship's lines. This illustration shows a perfect 36-in. metal rat guard correctly applied to bow lines. Note that both lines pass through one guard. This guard is midway from ship to shore and well over water, thus preventing rats on the ship side of the guard from springing from line to dock



Trends in Consumption of

CEREAL PRODUCTS



(a) *No total estimated for 1927 because of incomplete data; items recorded equal 231 pounds.*

How consumption of cereal products has shifted

By E. G. MONTGOMERY
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CHANGES in consumption of cereal products represent what probably is the most remarkable modification of American habits in consumption of standard foods that has occurred in recent years. The decline in per capita consumption, amounting to something more than 30 per cent in a period of less than 30 years, has occurred largely in the case of wheat flour and corn meal, the two major items of cereal diet. Similar trends downward are to be noted in the case of rye flour and buckwheat flour, but neither of these commodities has ever been of as great importance as have wheat and corn products.

The earliest available estimate of wheat-flour consumption is for the year 1879, when the per-capita consumption appears to have been approximately 226 lb. During the 25 years following, there was only a slight decline, since the consumption appears to have been 222 lb. in 1904. But in the following decade the decline was 12 lb., to approximately 210, and a still more marked decline occurred in each of the next two five-year intervals, amounting to 15 and 20 lb. respectively.

Since 1924, when the apparent consumption was 174 lb. per capita, there seems to have been no significant change in our wheat flour use in the United States. The large drop of 35 lb. per capita which occurred in the decade from 1914 to 1924 is the more remarkable since during this period the purchasing power rose rapidly throughout the country. During the decade meat consumption per capita increased from 133 to 150 lb. or about 13 per cent. Hence, it seems safe to conclude that with the large increase in purchasing power of the wage-earners of the country there came about a decline in bread and an increase in meat consumption.

Data for consumption of rye, buckwheat, and corn products indicate a similar trend, except that the major decline in the use of corn meal took place decidedly earlier. Between 1889 and 1894 the decline was over 25 per cent, a percentage drop which was duplicated in the following five years. Large decreases continued in the next decade, but since 1919 there has been substantially no change in the estimated use of corn meal per capita. This product always has been consumed most extensively in the cotton belt. It would be of considerable interest to know just what brought about such a startling change in food habit in this area during the first 20 years of the present century.

It should also be noted that 30 years ago there was a considerable consumption of cereal products in the brewing and distilling industry. Exact figures are not available, but it is certain that in 1900 a substantial amount of cereals was consumed in this way.

The decline in consumption of cereal products does not mean that the American consumption of carbohydrates has decreased by a corresponding percentage. During the interval when a decrease of 120 lb. per capita in consumption of cereals has been taking place there has occurred also an increase in sugar consumption, amounting to approximately 44 lb. per capita, vegetable oils have also increased 10 lb. per capita, and a substantial increase in both dairy and fruit products is shown. Therefore, it may well be that the total consumption per capita in terms of calories has not changed in the 30 years under consideration.

NEW TYPES of cereal derivatives have developed rapidly during the past 25 years, creating what is practically a new cereal industry for the production of breakfast foods. At the beginning of this quarter century practically the only product of this character used extensively was rolled oats; now the consumption of a wide variety of these products amounts to approximately 12 lb. per capita. Unfortunately, we do not have data sufficiently accurate to indicate what the rolled-oats consumption was at the earlier time.

Another development has occurred in the use of a wide variety of prepared and self-rising flours, of which the present consumption is approximately 7.5 lb. per capita. Apparently, these products have largely replaced the old-style buckwheat flour which played an important part

in the diet of 30 years ago for the making of buckwheat cakes.

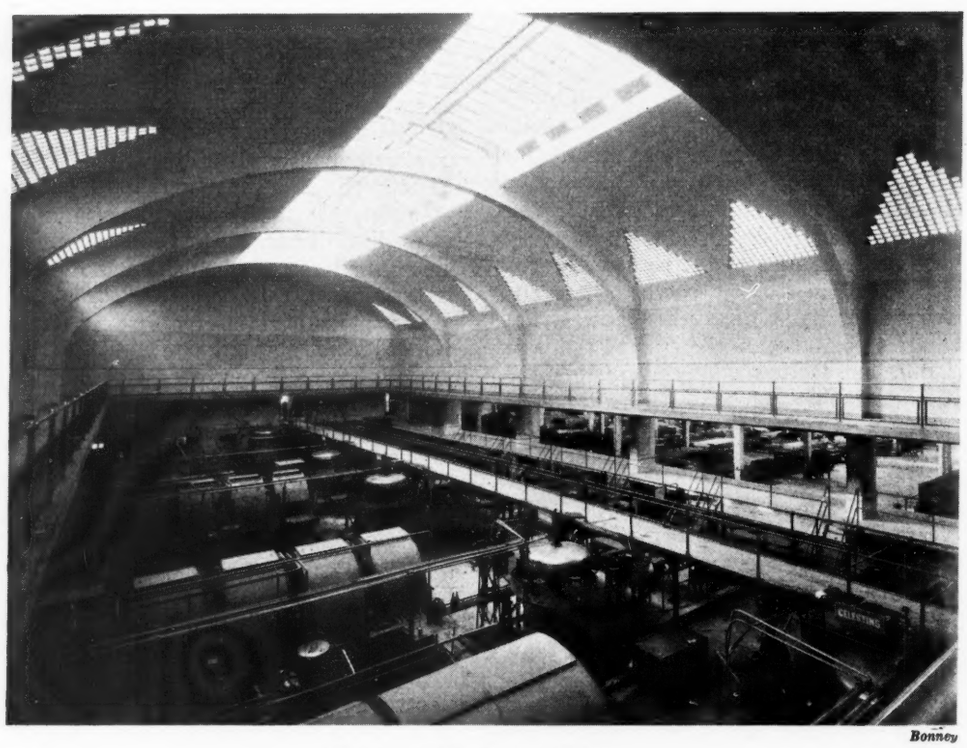
Another important development in the last 30 years has been the rise of the commercial baking industry. Data available are expressed in value only, but they give a very good indication. For example, the value of bakery products in 1900 was estimated at $175,000,000, or about $2.33 per capita. The value of these products grew to about $5 per capita by 1914, and to about $10 per capita in 1919; at present it is about $11 per capita. However, due to the fact that the price of a loaf of bread went from approximately 5c. to 10c. during the five-year period 1914 to 1919, the dollar change does not correctly portray the real change in quantities. If we convert the values given to the basis of the 1913 dollar, we then note that the rise of the bakery industry has been rather gradual, going from approximately $3 per capita in 1900 to approximately $7.80 per capita in 1927, the increase for each five-year period being fairly constant.

To sum up, we find that the general consumption of cereals has declined from approximately 350 lb. per capita in 1889, to about 230 lb. per capita in 1927. It would be interesting to know all the causes and factors that brought about this remarkable change in consumption of standard food products. The most obvious conclusion is that with the rapid rise in standards of living, people have desired a more varied diet. To satisfy this desire there has been vast improvement in transportation and in wider seasonal availability of various perishable products, such as meats, fruits, and vegetables. And, too, the preparation of many materials in new and attractive forms, such as the development of the canning industry and the increased use of products containing higher percentage of fats and sugars, has contributed to change in food habit. In other words, the desire for a more varied diet and the ability to satisfy it probably has played a major part in the decline of consumption of cereals, principally wheat flour and corn meal.

Estimated Per Capita Consumption of Cereals (Pounds)

Commodity	1889	1899	1909	1919	1923	1925	1927
Wheat flour	223.9	222.2	209.7	195.4	173.5	177.0	171.5
Rye flour	6.8	4.6	3.4	2.5	2.5	2.7	2.8
Corn meal	117.0	103.3	57.8	25.3	27.2	22.7	22.3
Hominy and grits	3.7	4.1	9.2	2.8	.....	.....	.....
Rice, cleaned	3.6	4.1	7.2	6.2	3.4	6.3	5.0
Buckwheat flour	2.9	2.9	2.2	1.0	.4	.4	.....
Barley malt	.....	.....	.....	.....	.....	5.1	5.4
Breadfast Foods, made from wheat	.....	.....	.....	.....	.....	.....	3.01
made from oats	.....	.....	.....	.....	.....	.....	6.55
made from corn	.....	.....	.....	.....	.....	.....	2.41
made from other Grains or mixed grains	.....	.....	.....	.....	.....	.....	.33
Prepared flour	.....	.....	.....	.....	.....	.....	7.41
Macaroni, spaghetti, vermicelli and plain or water noodles	.....	.....	.....	.....	.....	.....	3.75
Noodles, egg	.....	.....	.....	.....	.....	.....	.28
Cornstarch	.....	.....	.....	.....	1.4	1.3	.....
Various farinaceous substitutes	.....	.....	.....	.....	.....	.40	.39
Total	357.9	341.2	289.5	233.2	208.4	215.9	(a)

(a) No total estimated for 1927 because of incomplete data; items shown equal 231 lb.



Bonney

French Bottling Plant

In contrast to the ordinary European industrial attitude toward visitors, the plant in which the famous Vichy water is bottled has been purposely designed to attract them. Few American plants of any kind can show interiors as good looking as this. The cylindrical machines on the left are bottle washers.

FUMIGATION:

Everybody's Problem

By STROUD JORDAN
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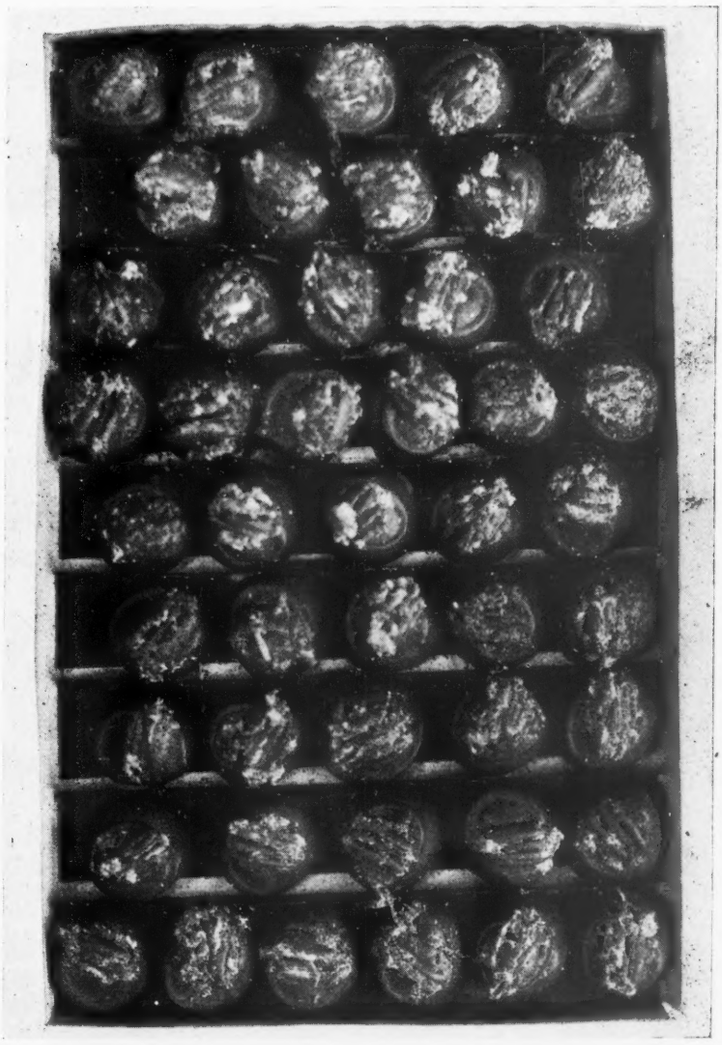


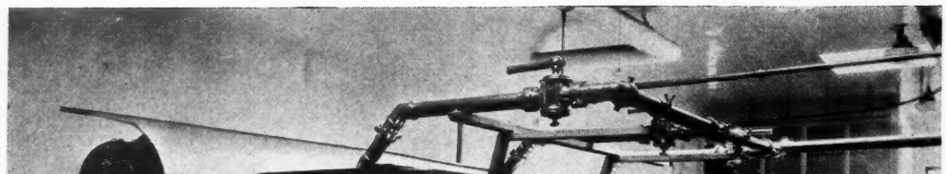
COMPLETE and permanent sterilization of nut meats is not only desirable but essential. To accomplish this requires co-operation of every agency handling such products, from producer to consumer. Expenditure of money by the producer, to insure a sterile product, becomes sheerest extravagance, if the common carrier, jobber, and retailer do not do their share of the job.

Being familiar with conditions which exist in many retail shops during late spring, summer, and early fall, it was decided to sterilize a stock box of nut-topped chocolates and to place this package in the stockroom of a nut shop where moths were to be seen. The experiment was started in June, and six weeks later the box was removed, opened, and examined. The results were as shown in the accompanying photograph. One hundred per cent infestation was found on the top layer, while only the edges of the underneath layer had been reached. The bottom layer showed no signs of attack and apparently was 100 per cent sterile. The moths had either crawled between the top and sides of the box, which is not probable, or deposited eggs around the edge of the cover, so that the larvas crawled in for food as soon as they were hatched out.

If the retail shop had been free from insect infestation this could not have happened. Even if the box had been sealed airtight, it would have been necessary to open it in order to serve from it. It then became an unfinished package, and, if exposed in broken condition, all trouble and expense incurred in the sealing would have been wasted. The goods would surely have been infested before they were all sold, unless they were sold promptly.

Such results always are blamed on the manufacturer and sometimes severe complaints and loss of customers result. Although the manufacturer may not be at fault for the actual infestation, he cannot escape all blame. It is his duty to co-operate and to educate the handlers of his products. Too many manufacturers assume their duty done when goods are shipped, the bill made out, and the money collected.

In this connection it might be mentioned that sealing nut meat products in so-called airtight containers has been suggested as an alternative, but not all products that contain nuts may be so handled. Further than this, the expense of such a process is not to be assumed lightly, because, except for certain periods of each year, the necessity for such expense is not demonstrable.



Three 80-qt. variable-speed ice cream freezers showing location of rheostat and control handle just above thermometer in brine line

Varying SPEED OF EQUIPMENT

To Make Better Products

By WILBUR A. THOMAS
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Hage's Ice Cream Company, Inc.,
San Diego, Calif.

BY THE use of a cold freezing medium the freezing of ice cream may be accomplished very rapidly. In common practice, calcium chloride brine is used, or, in case of direct-expansion freezers, liquid ammonia. As many as 8½ runs per hour per freezer may be made if a —20-deg. F. temperature is used and the blades of the freezer are kept in excellent condition, sharp and straight-edged.

However, the body of the ice cream tends to be rough and there is a marked vibration of the machine. Of the two faults, the first is the more serious, for an ice cream of smooth texture with small water crystals is very desirable. The second fault is serious enough, because excessive vibration causes rapid wear and tear of the machinery.

Coarseness of texture seems to be caused by the very cold freezing medium, which freezes the ice cream on the walls of the freezer so rapidly that the blades, even though sharp, remove it in chunks, rather than in a fine grained slush. If a small quantity of mix—a mixture of the constituent materials to be frozen, commonly referred to in this abbreviated form—is drawn from the freezer 45 seconds after the freezing medium is turned into the freezer shell, there will be chunks of frozen mix floating in the thoroughly chilled liquid. These chunks seem to disappear during the whipping process, but doubtless they are never entirely dispersed.

A warmer medium, zero or —5 deg F., would somewhat relieve vibration, for the blades would meet with less resistance while shearing the ice cream from the freezer walls. The body of the cream would not be benefited appreciably, for the more slowly frozen creams seem to contain larger ice crystals, which result in roughness of texture.

Then, too, rapid freezing is desirable, in that it saves labor and additional freezing equipment. With the hopper system, there is a distinct advantage in completing a run in 7 or 8 minutes or less, for in such a case the ice cream adhering to the walls of the hopper does not have time to soften to any great extent. In case it does melt down even slightly, as is sure to happen if 12 to 15 minutes elapses between the emptyings of a battery of freezers, the fresh ice cream will force down the partly melted cream and the first few gallons drawn at the filling table will be slushy and poor texture will result. So every now and then the consumer is quite sure to get some ice cream which has a distinctly inferior body.

Hage's Ice Cream Company was faced with all these problems and sought a solution in the following manner. To the battery of three 80-qt. Miller brine freezers

shown in the illustration on page 306, brine was furnished against a head of about 30 in. to a 6-in. header, located just to the rear of the freezer. A 3½-in. feed line and a 3-in. centrifugal pump were used. The return header also was of 6-in. pipe, and the return line of 3½-in. size. Thus, any choking was avoided, for volume of brine, not pressure, counts in rapid freezing.

These freezers came from the factory equipped with 7½-hp. motors, and had a dasher assembly speed of 169 r.p.m. when fully loaded. This machine, employing three scraper blades, gave approximately 510 passages per minute of a blade at a given point in the freezer barrel. As an experimental unit, freezer No. 3 was chosen, for the motor and chain drive were the most accessible of the three. A sprocket was placed on this motor which gave a dasher speed of 220 r.p.m. at peak load. Thus the speed of the dasher assembly was increased about 30 per cent.

All three freezers were operated simultaneously, freezing mix from the same source. A brine varying only a few degrees from —18 deg. F. was used. Two samples of frozen ice cream were taken at the freezers while the machines were emptying, one from No. 3 and one from No. 2 freezer. The samples usually were taken in round quart paper cans and placed immediately in a —5 deg. F. hardening room.

Yield was checked at the freezers by scales designed to show the amount of overrun—or increased volume incident to freezing. Although this method of controlling yield has some value, it is not extremely satisfactory. For, granting that the measure cup has been filled without a few large air bubbles in the frozen cream, much may happen to yield between the time the sample is taken and the cream is drawn. This is perhaps more especially true when freezing eight or nine runs per hour. As is shown by an accompanying illustration, these freezers are equipped with recording Drawrites—modified recording ammeters—which are a great aid to the freezer operator in controlling yield.

As a further check on yield, these samples were weighed after twelve hours or longer in the hardening room and samples of equal overrun were selected for testing, one from No. 3 freezer and one from No. 2 freezer. They were so labeled that the testers were making a blind test.

Samples from freezers Nos. 2 and 3 were compared for texture. The ice cream from freezer No. 3 (high speed) was found to be smoother than that from freezer No. 2. This test was repeated six times, using a different mix for each test. Freezer No. 3 (high speed) produced smoother ice cream in every trial.

The rapidly moving scrapers apparently were shearing the frozen film of the walls of the freezers much in the form of hoarfrost. This formed smaller ice crystals with a resultant closer-grained, smoother ice cream.

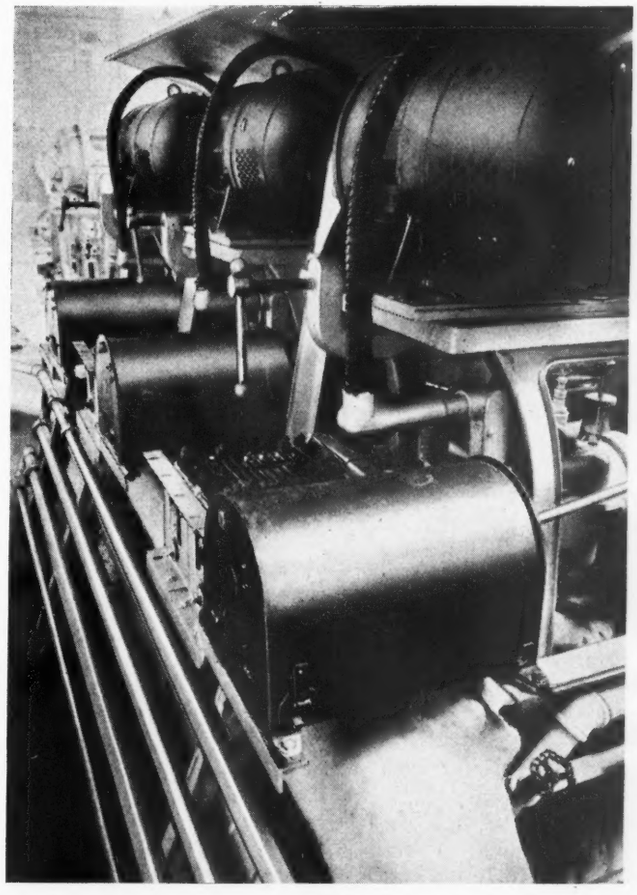
Vibration at the higher dasher speed—i.e., 220 r.p.m.—was considerably lessened. However, the motor over heated. This, of course, could have been overcome by using a larger motor. The power consumed was greater than in the case of the other two freezers running at slower speed. The friction set up by the stiffening mix being drawn in a clockwise direction by the scraper blades, and in a counter-clockwise direction by the beater, undoubtedly accounted for this.

The worst feature of No. 3 freezer was the fact that the yield varied a great deal as the ice cream left the freezer while emptying. As the level of frozen ice cream dropped in the freezer while being emptied, the yield increased 10 or 15 per cent after the first third was drawn and decreased 5 or 10 per cent as the last third was drawn. This made it difficult to control yield; and the variation of yield of the ice cream as it was being emptied from the freezer, even though it were mixed while being drawn from a common hopper, would result in some cans of normal yield, some of higher yield, and some of lower than normal yield.

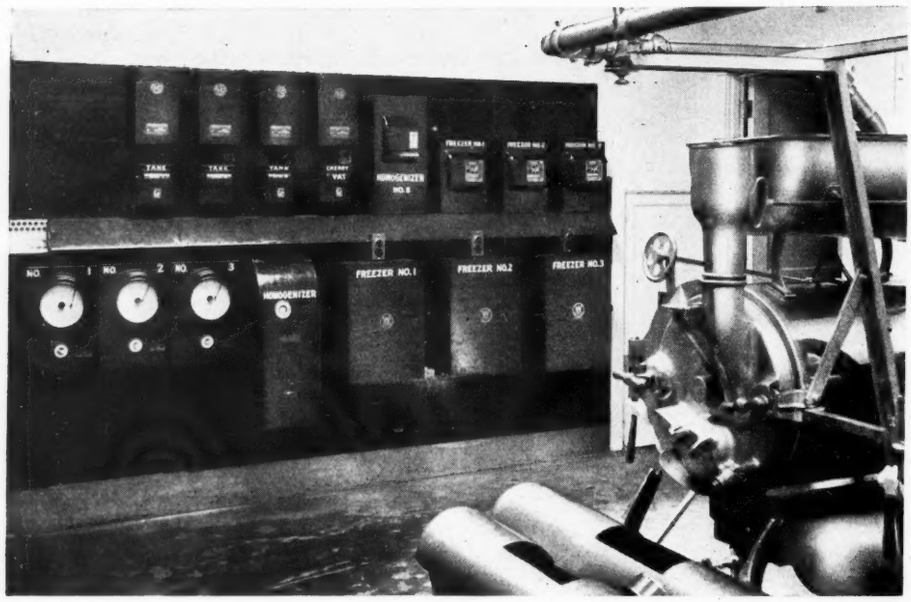
Freezing speed was not increased in No. 3 freezer, but it produced at approximately the same rate as freezers Nos. 1 and 2. In order to draw a cream of the same stiffness, it was advisable to attain a slightly lower temperature before turning off the brine. This was necessary because rapid whipping apparently caused some frictional heat. The lower temperature attained while the brine was on, offset the slight rise in temperature while whipping.

In spite of these disadvantages, the ice cream was distinctly superior to that frozen from the same mix in the freezers running at normal speed. Variation in yield, however, practically eliminated this method of freezing.

The next experiment was the installation of a 10-hp. variable-speed motor on No. 3 freezer. This permitted a high speed while the brine was on and a much lower



Motor, rheostat, and grid installation above brine header at the rear of freezers



Freezing-room switchboard and Drawrite controllers

speed for whipping and unloading. This variable speed motor had an excessive lag in speed at full load in all speeds except the highest. By equipping this motor with the proper sized sprocket, it was possible to turn the dasher assembly on the freezer, while not fully loaded, at 232 r.p.m. with the motor running at highest speed. The speed of this freezer was 224 r.p.m. while at peak load, which occurred just a few seconds after the brine was shut off. This speed was continued for about one minute, then reduced to 100 r.p.m., and the whipping completed. Yield was obtained very rapidly after the speed was reduced to 100 r.p.m. The ice cream was drawn from the freezer with the dasher speed of 91 r.p.m., the speed increasing up to about 118 r.p.m. before the freezer was closed ready to receive a new charge of mix.

After the speed was reduced to 100 r.p.m. for whipping, a lag in speed occurred that caused the dasher assembly to turn at 91 r.p.m. Investigation showed that the load actually increased, and that the temperature of the ice cream continued to drop during the whipping period. This undoubtedly was caused by the brine that remained in the lower half of the freezer shell after the flow had been shut off. Brine inlets and outlets enter the freezer barrel on one side.

In experiments, speeds other than the highest and lowest were used. The control assembly furnished thirteen speeds which gave, while fully loaded, revolutions per minute varying from 224 to 91 at intervals of about 10 r.p.m.

ONE trial consisted of using 224 r.p.m. while the brine was on, about 170 r.p.m. during the whipping period, and 91 r.p.m. to unload. This and other combinations of speeds appeared not to produce any better results, and overburdened the freezer operator, who was kept reasonably busy even when using the highest and lowest speeds.

One important use for some of the intermediate speeds was found. Certain flavored ice creams, especially those containing nut meats, failed to give proper yield at 100 r.p.m. The speed was increased late in the whipping period to about 150 r.p.m. for a few seconds and satisfactory yield was obtained. Intermediate speeds were found advantageous also in freezing sherbets and ices.

Emptying at the lower speed did not take more time than at a speed of 169 or 220 r.p.m. Samples, taken in the manner just described, gave satisfactory results. The cream was smoother and of better body than that frozen in the freezers running at normal speed. Vibration was decreased during the time the high speed was used and eliminated almost entirely during the period of low speed. Apparently, there was no excessive warming of the frozen cream during the whipping period, as was the case where the high speed was used entirely through the whipping and unloading period.

Yield was satisfactorily controlled, there being a variation of only 2 or 3 per cent in the ice cream drawn at the first, intermediate, or last stage. Yield on the entire batch was more easily controlled than in the case of the constant high-speed freezer, but there was not any noticeable advantage in this respect over the speed ordinarily used.

LESS power was used with the variable-speed motor application than on the constant high-speed freezer. This was caused by less current being used while the dasher assembly was being turned at low speed. There was no overheating of the motor. However, it must be remembered it was of larger capacity and the motor was given what amounted to a partial rest period while the dasher assembly was revolving at low speed.

The rate of freezing was increased about 10 per cent with the variable speed hook-up, and 9½ runs per hour were made, using a —18 deg. F. brine. Using a —25 deg. F. brine and a 30 deg. F. mix it was possible to obtain as many as twelve runs per hour. A shorter time was used in whipping and no more time was used in freezing, unloading, and reloading.

So successful was this experiment that the other two freezers were equipped with the same type of motor. The resistance grids and the speed control assemblies were mounted on a platform constructed on the rear end of the freezers, just below the motor bases, as is shown in the accompanying view. A shaft from the control assembly was brought along the right-hand side of the barrel of each freezer and a large valve handle attached,

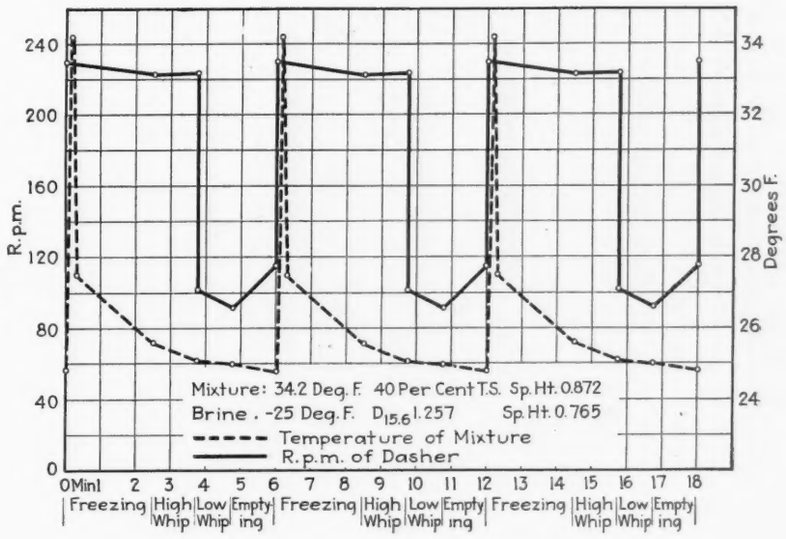
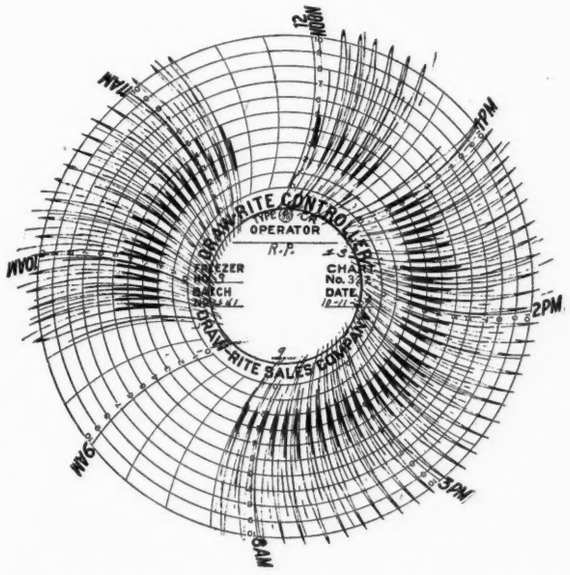


Diagram showing freezing cycle when using variable-speed freezing. Six minutes suffices for each freezing

enabling the operator to control the speed of the freezer dasher at will.

The accompanying chart shows the time of the different speeds used, with a —25 deg. F. brine. Within the course of a few seconds the operator starts the load into the freezer barrel from the mix hopper, turns up the speed of the dasher to 232 r.p.m., and turns on the brine. The brine is shut off after 3 minutes, the speed turned down to 100 r.p.m. after 4 minutes, and the whipping carried on at low speed—i.e., 100 to 91 r.p.m.—for 45 seconds, when unloading is started and continued for 1 minute and 15 seconds, at which time the freezer discharge gate is closed and a new load started. The temperature of the ice cream as it leaves the freezers is between 24.5 deg. and 25 deg. F. The freezers are not permitted to empty entirely. About 1½ gal. of frozen ice cream is left and the new load added to this. Time is saved by this and the yield is more accurately controlled.

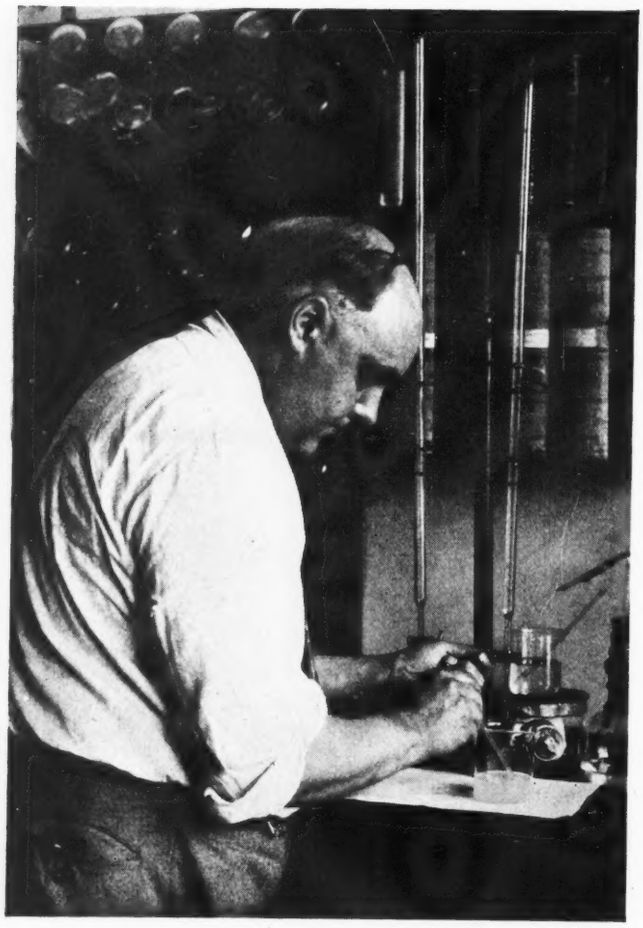


The chart reproduced here shows one single line to the edge of the chart at the beginning of each run. This is caused by turning the motor up to high speed. The sudden load caused by speeding the motor up causes the needle to swing outward rapidly. It returns immediately to its proper position and starts to record the history of the freezing of each run of ice cream

These three freezers have frozen over 500,000 gal. of ice cream since being equipped with the variable-speed motors, and are operating satisfactorily. As soon as the blades begin to show any signs of dullness or curling over toward the back beveled surface, they are removed and replaced by an extra set of blades kept on hand. Dull blades increase friction greatly and tend to produce coarse ice cream. The removed blades are taken to the company garage and sharpened by a flat Viven or Beaver soft-metal file, such as are ordinarily used in babbitt bearing work. In sharpening, the blades are beveled like a new blade, care being used to keep the edge straight. The blades are then shimmed with Monel metal shims, the beveled edge is heavily tinned, and the hinge clips are replaced.

Shimming is done to keep the blades at the same height as a new blade, and permits them to take the proper pitch against the freezer wall. This reduces friction, as a well-worn blade will stand more nearly vertical to the freezer wall and act somewhat as a brake, rather than as a shearing knife. In other words, as fast as metal is worn off or cut off the shearing edge of the blades, it is replaced by shims on the back edge. Permanent shims—pieces of brass plate ½ in. thick, fastened in place with counter-sunk machine screws—are used instead of a number of thin Monel metal shims, as soon as $\frac{7}{16}$ in. has been removed from the shearing edges of the blades. These permanent shims are then tinned heavily. The tinning of the sharpened edges causes the blades to wear longer in the freezer, and reduces friction.

Too much importance can scarcely be placed on the advisability of keeping freezer blades sharp. There is one fault found in most freezers that needs a remedy: The barrels of freezers usually are made of a piece of drawn tubing, and small raised and depressed areas result. Even the best blade fails to remove the frozen cream from the depressed areas. Some coarseness results, as well as an insulating effect. Much better results might be obtained if the freezer barrel were machined on the inside as a true cylinder, and so smoothly finished that the edge of the blade would shear the frozen film of ice cream off the wall completely.



O. E. SHOSTROM

Importance of T

By RAY W. CLOUGH

and

O. E. SHOSTROM

Chemists, Northwest Branch National Canners' Association
Seattle, Wash.

Surprising results, which indicate that a minute quantity of sulphur in canned fruits is as beneficial under certain conditions as it is objectionable under others, emphasize once more the importance of little things—whether it be a milligram of a foreign substance, a few bacteria, or a tiny variation in acidity or temperature. In the work of Messrs. Clough and Shostrom is a real lesson for those who are likely to lose sight of titration for tonnage figures, or of microscopes for mass production.

THE CANNING INDUSTRY has devoted a great deal of effort to the improvement of its products and to prolonging the period during which they will remain merchantable. The tin can, although generally well adapted to the manufacturing and shipping hazards of the food industry, falls far short of perfection. It is rather quickly corroded by certain foods, with consequent swelling or perforation, either of which results in an unmerchantable product. In recent years, methods of manufacturing the base plate have been studied and improved; better methods have been devised for coating this with tin; and more satisfactory enamels have been evolved. In spite of all this effort, however, tiny breaks in the enamel and tin coating remain, and are promptly attacked by certain fruit juices. Dark colored berries and fruits are among the worst perforators, their activity along this line having been rather definitely linked up with the anthocyanin colors present in relatively minute quantities. As small quantities of oxygen gas greatly accelerate perforation, it is eliminated from the can as completely as possible.

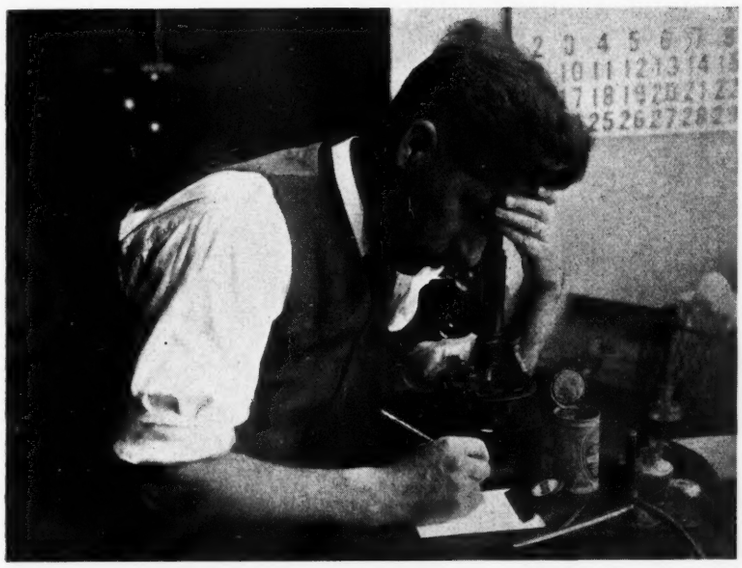
Some rather striking effects of extremely small amounts of certain sulphur compounds are found in canned fruits. In 1923, some badly swollen No. 10 cans of water-packed gooseberries were received at this laboratory for investigation. Upon opening the cans, a strong odor of hydrogen sulphide was noted, together with some blackening of the inside of the can. Inquiry developed the fact that these gooseberries had been sprayed with a lime-sulphur mixture shortly before picking. Experimental packs of sulphur-free gooseberries from normal cans were repacked, with the addition of definite quantities of lime-sulphur spray, and swells developed within two months, although control cans remained normal. These tests were repeated several times, with the following results: Lime-sulphur spray, although present only to the extent of less than 5 parts per million, caused swells in plain cans within a few months; larger quantities brought about the changes much more quickly, indicating a quantitative relationship. Enameled cans remained normal longer, and re-enameled cans longer still. Sugar seemed to retard corrosion, since sirup packs remained normal longer than corresponding water packs (*Canning Age,* June, 1924).

As a result of the tests growers were warned not to spray after the berries formed, and many samples of fresh gooseberries were submitted to the laboratory for analysis in order to prevent the use for canning purposes of any that had been so sprayed.

In the refining of sugar, sulphur dioxide sometimes is used, and a variable quantity remains in the refined product. This is particularly true of some of the imported refined sugars from Central and South America. From 3 to 107 parts of sulphur dioxide per million have been found in samples tested by this laboratory. The sulphur was first suspected of darkening the inside of the cans and of contaminating the canned product with unsightly black iron sulphide. Later the possibility that

TRACES OF SULPHUR

On Corrosion of Food Containers



RAY W. CLOUGH

sulphur was responsible for swelled cans was considered, and experimental packs of gooseberries, using sirups made from several sulphur-containing sugars, were prepared. These packs began to swell rather quickly, and in general acted similar to the packs containing lime-sulphur spray, clearly indicating that sulphur dioxide residues in sugar constitute an extra hazard, at least in the canning of gooseberries.

An extensive series of experimental packs, covering a variety of fruits and berries, different types of cans, and a number of foreign sugars, was put up in 1925. The results obtained with gooseberries confirmed all previous work with that fruit, but the results with some other dark colored fruits were contradictory in some respects. Since the results were based on comparatively small packs, they were never published. Subsequent work has confirmed many of them, however, so that the findings may now be given. One series of experimental packs with gooseberries in plain cans was designed to bring out the comparative activity of different compounds of sulphur in producing swelled cans. This test was suggested by the fact that lime-sulphur spray contains several compounds of sulphur. In our packs, however, sodium compounds of sulphur were used, because they were easier to obtain in pure form. The results are shown in Table I.

Table I—Action of Various Sulphur Compounds on Gooseberries in Plain Cans

Sodium sulphate and bisulphate	—no effect
Sodium sulphite and bisulphite	—very active
Sodium sulphide and bisulphide	—active
Sodium thiosulphate	—most active
Flowers of sulphur	—active

The effects were quantitative to some extent; that is, while 2 parts per million of sulphur in the form of sodium thiosulphate produced swells in three months, 40 parts produced them in less than two months. On account of the extreme activity of this compound, it was the one chosen for further study.

A pack of Royal Anne cherries in plain cans, using 40 per cent sulphur-free sugar sirup and different amounts of lime-sulphur spray, showed that 5 parts of the dry spray to a million parts of canned cherries had little, if any, effect. Forty parts, on the other hand, had a very decided effect, swelling some cans in eight months and every can within a year. A pack of Black Republican cherries in re-enameled cans, although prepared in exactly the same way, gave entirely opposite results; that is, while the cans without spray became swells and perforated, those containing 5 parts of spray remained normal for two years, and those containing 40 parts were normal in appearance at the end of three years, having from 3 to 11 in. vacuum. However, when the latter cans were opened, they had a slight odor of hydrogen sulphide.

Another series of experimental packs was designed to test out the common organic acids in the presence of water, sulphur-free sugar sirup, and a foreign sugar containing 74 parts per million of sulphur dioxide. Plain cans were used, and acid solutions containing 10 grams of acid to 990 grams of water. The results indicated that sulphur dioxide accelerated corrosion in the case of citric and lactic acids. In the case of acetic, malic, oxalic, and tartaric acids, there was no marked difference between the different sugar packs. With tartaric acid, the presence of both sugars increased corrosion beyond that in the water pack.

The most surprising results were obtained with rasp-

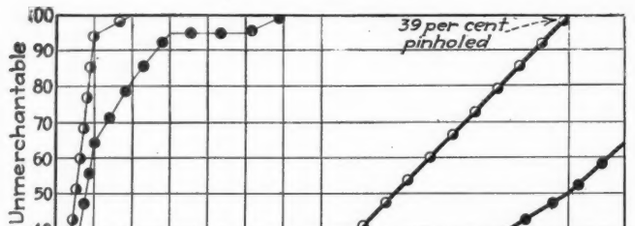


Fig. 1—Effect of sulphur on corrosion in canned gooseberries

berries, and with Byng, Black Republican, and Royal Anne cherries, packed in re-enameled cans with sirups made from sulphur-free sugar and from sugars containing various amounts of sulphur dioxide residues. Contrary to expectation, the presence of sulphur in these packs frequently appeared to be beneficial; that is, cans remained normal longer when it was present than when it was absent. These results were so interesting that larger packs covering less ground were planned. These were put up in 1927, and after 2½ years' storage have given results which seem sufficiently interesting to justify publication. They have completely confirmed the results obtained with the 1925 packs. *Small quantities of sulphur are detrimental in some packs of fruit and berries, but beneficial in others.*

Two berries and two fruits—namely, gooseberries and strawberries, Byng and Royal Anne cherries—were included in the 1927 pack. Each was packed in plain and re-enameled cans, and in 40 per cent sirups made from different sugars, as follows:

1. Sugar free from sulphur.
2. Sugar containing sulphur dioxide to the extent of 72 parts per million (resulting in a canned product containing about 5 parts per million of sulphur).
3. Sugar free from sulphur but to each can was added a solution of sodium thiosulphate sufficient to give 5 parts per million of sulphur to the canned product.

The fruit was prepared in the usual commercial way in the cannery, but was carefully weighed into each can and the proper sirup also carefully weighed in. The cans were then placed in the cannery line for the usual exhaust, closure, cook, and cool. Next they were put in a storeroom held at a fairly constant temperature throughout the year (about 60 to 70 deg. F.). Examinations were made at intervals for a year, but, unfortunately, were discontinued during the second year, with the result that the "curves" during this period have a straight-line character that does not represent adequately what took place during that period. However, though this left a few of the curves in doubt, most of them were either completed before the end of the first year or had not started at the end of the second. While ordinary empty commercial cans were used, they were so reassembled from the original cases that each case of the completed pack contained two cans from each of the original cases of empty cans. This practically eliminated any chance for error so far as the cans were concerned.

The results are given in the four charts, where percentage of unmerchantability (both swells and perforations) is plotted against months of storage. The same legend applies to each chart. Light lines represent plain can packs; heavy lines, re-enameled. Circles without shading indicate a sirup free from sulphur; circles half-shaded indicate a sirup made from sulphur-containing sugar, and circles entirely shaded indicate a sirup to which sodium thiosulphate had been added. Thus, a light line connecting unshaded circles represents a pack in plain cans without sulphur. Whenever perforations occurred, they are shown on the charts in the proper place.

Results with gooseberries are given in Fig. 1. It is seen that in plain cans (light lines) the presence of sulphur was very detrimental, resulting in from 60 to 90 per cent spoilage in two months. There was some loss in plain cans without sulphur, but this did not start until between eight and ten months' storage, and at the end of 30 months nearly 70 per cent were still normal. Re-enameled cans resisted corrosion for some time, but here, too, sulphur was detrimental, the foreign sugar pack resulting in 100 per cent spoilage in 27 months, 39 per cent of which were pinholed. This was the only case in which the presence of sulphur seemed to increase the pinholing or perforation. The results show that re-enameled cans are the safest to use with gooseberries, particularly where there is danger of a small quantity

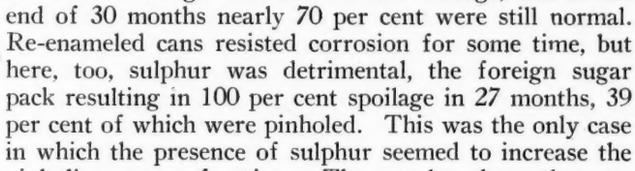


Fig. 2—Effect of sulphur on corrosion in canned strawberries

of sulphur from the spray or from sulphur dioxide residues in the sugar.

Strawberries are never packed in plain cans commercially, on account of the bleaching effect of the hydrogen formed by corrosion. As shown in Fig. 2, sulphur increased the corrosion in this type of can greatly, the thiosulphate producing 80 per cent swells in two months. Owing to the fact that the cans were not examined between the fourteenth and twenty-seventh months, the curves for the re-enameled cans lie closely together. Judging from the steep slope of the curve given for the sulphur-free pack (heavy line joining unshaded circles), this pack probably became 100 per cent unmerchantable long before the next examination when 82 per cent were found to be pinholed. The presence of sulphur seems to have retarded perforation, since only 8 per cent of the foreign sugar pack and none of the thiosulphate pack were perforated. Although the evidence is not particularly satisfactory, what there is indicates that thiosulphate is beneficial in a pack of this berry in re-enameled cans.

In Fig. 3 are given the results for Royal Anne cherries. This fruit usually is packed in plain cans, and the addition of thiosulphate was clearly detrimental. However, although the cans swelled rather quickly, none perforated, as was the case in the corresponding pack without sulphur. None of the plain cans with foreign sugar perforated, and at the end of 29 months some 30 per cent were still merchantable. It appears, therefore, that the case against sulphur here is somewhat confusing.

The most interesting results are those obtained with re-enameled cans; those without sulphur were 100 per cent pinholed at the end of 26 months, but of those containing sulphur, nearly every one was normal at the end of 29 months. These cans had about 9 in. vacuum and refused to become springers even when the cans were hit sharply on their ends; furthermore, such cans as have been opened have been found to be in good condition—the fruit has a good color, odor, and flavor, and the cans are scarcely corroded at all.

Byng cherries also are frequently packed in plain cans, for they have an abundance of color and can suffer some loss through bleaching and still be presentable. Furthermore, this fruit is a very bad perforator in re-enameled cans, and the plain can apparently is the safer package to use. The presence of sulphur in the plain cans resulted in swells, the thiosulphate causing 70 per cent of the cans in that pack to swell in nine months, as shown in Fig. 4. No perforations were found among the cans containing sulphur, however, although nearly half of the sulphur-free, plain cans were perforated. As with the Royal Anne cherries, the most striking results were those obtained with the re-enameled cans. While all of the sulphur-free cans became unmerchantable and finally perforated, all of those containing sulphur were normal at the end of 29 months. Furthermore, these cans had a good vacuum, refusing to become springers, even when hit sharply upon their ends. The contents of cans from this pack which were opened had a good color, flavor, and odor, and the cans themselves were in very good condition.

The action of the extremely small quantities of sulphur compounds in these packs well illustrates the importance of little things. It is difficult to understand how such minute quantities can bring about such striking and decisive results. Apparently, in packs of Byng and Royal Anne cherries in re-enameled cans, the presence of a small quantity of sulphur is beneficial, while in gooseberries in either type of can it is detrimental. It is possible that the difference in behavior with these two fruits lies in the difference in their coloring substances.

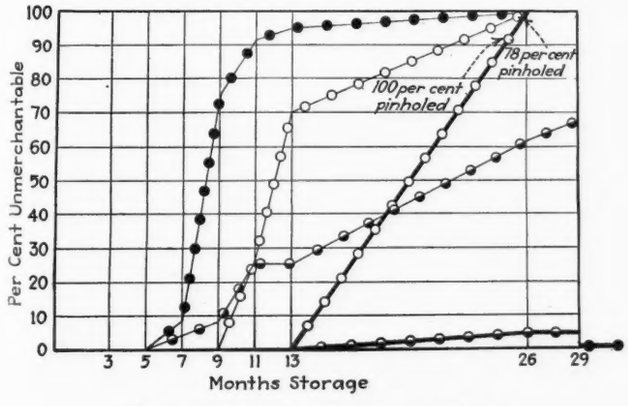


Fig. 3—Effect of sulphur on corrosion in canned Royal Anne cherries

The cherries contain water-soluble anthocyanin colors which have been shown to be intimately connected with corrosion. The green gooseberries contain only chlorophyll, a color not soluble in water and of entirely different chemical composition.

A great deal of work has been done upon corrosion in canned foods and many ingenious theories have been advanced to account for the difference in behavior of different foods toward the tin container. The effect of sulphur might possibly be explained on the ground that it increases the solubility of the tin coating but tends to protect the iron base from corrosion. In plain cans, where a large area of tin is exposed, if the tin were vigorously attacked, a large quantity of hydrogen gas would be formed and the cans would become swells. In re-enameled cans, where very little tin is exposed, even if all the exposed tin were dissolved, probably not enough hydrogen to swell the cans would result. The protective

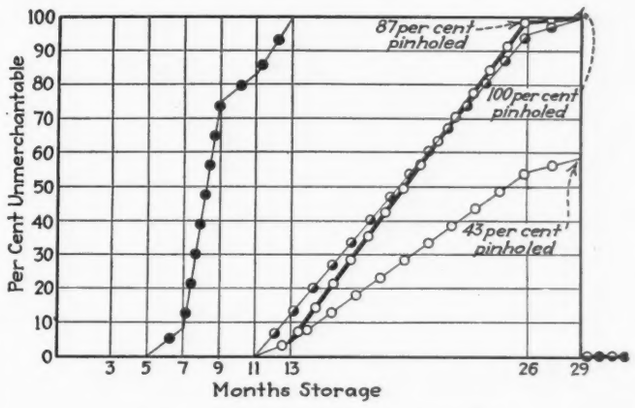


Fig. 4—Effect of sulphur on corrosion in canned Byng cherries

action of the sulphur upon the iron on the other hand would tend to keep down perforations. This is only a suggestion as to the possible reason for the striking results obtained in these experimental packs. Further work is necessary before an adequate theory can be advanced.

Several canners have expressed their intention of putting up experimental packs of some of the colored fruits and berries, adding thiosulphate in about the proportion given here. Since the crystalline sodium thiosulphate is a substance weighing four times as much as the weight of the sulphur contained, it would be necessary to plan the pack on the basis of 20 parts of the thiosulphate per million of the total canned product to give 5 parts per million of sulphur in the finished product. The amount to be added to the sirup will depend upon the percentage of sirup in the entire product. Sodium thiosulphate in the quantities given here is a harmless substance, easily obtained in very pure condition, and is comparatively cheap.

It is suggested that such experimental packs with all varieties of cherries, prunes, plums, and blueberries would be useful in helping to solve some of the problems of corrosion. One packer has already put up an experimental pack of cranberries. Re-enameled cans should be used and control packs, identical with the others except for the presence of thiosulphate, be prepared at exactly the same time and stored under the same conditions. It would be well to consult with some chemist familiar with canned foods and their preparation in putting up these experimental packs.

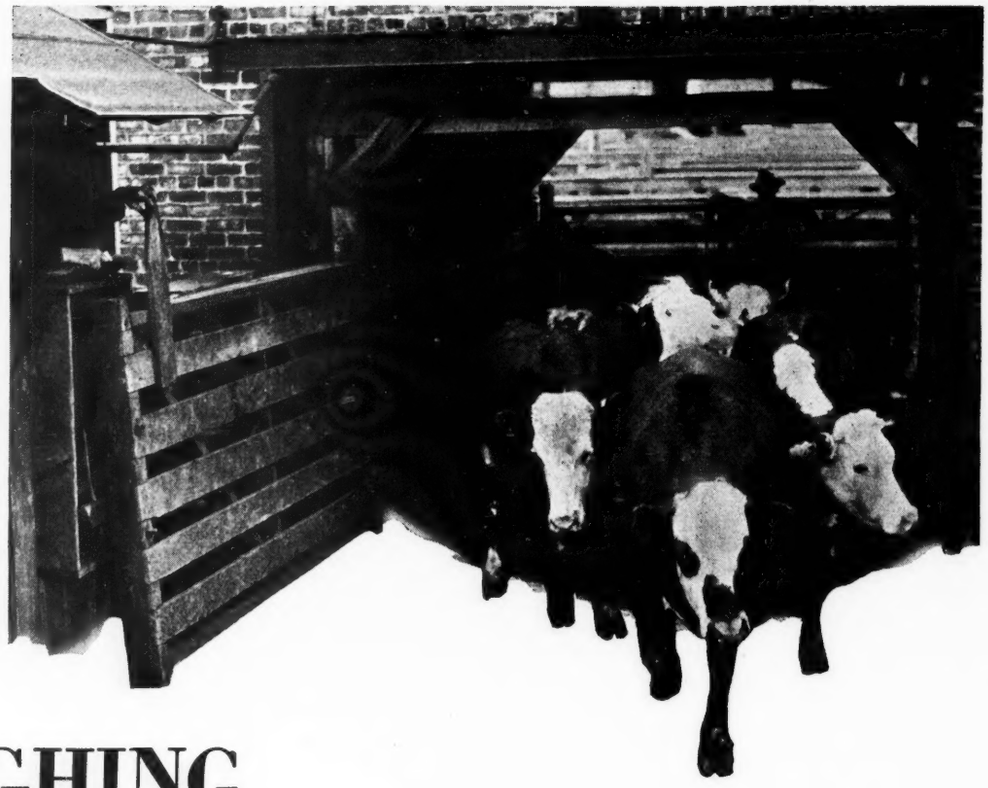


Fig. 1—A platform scale for small lots of cattle in the Union Stock Yards, Chicago. A recording device operated by the beam stamps the weight on a ticket, thus eliminating clerical errors by the scale man.

WEIGHING EQUIPMENT

Must Fit Each Task

By JOHN HOLMES
Vice-President, Swift & Company
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Accurate weighing of incoming raw materials and of the finished product is an obvious necessity in practically all food plants. Accurate weighing at intermediate points also is vital if uniformity of product, and control of costs is to be accurately regulated. The diversified requirements which weighing equipment must meet is exceptionally well illustrated in the packing industry, where products of entirely different characteristics emerge from distinct methods of processing and divisions of plant operation.
—THE EDITORS.

AS IS WELL KNOWN, the modern packer markets highly perishable chilled beef, mutton, and veal, cut in halves, quarters or, at times, smaller fractions. Of the pork products, the loins and shoulders usually are sold fresh, the rest of the carcass being further subdivided and cured or in other ways processed before marketing.

Other products of the industry, such as hides, grease, glue, fertilizer, and the like, are each passed through distinct methods of processing before marketing either as units or in small containers. Each division of our business stands on its own feet and is on a profit and loss basis; therefore, in separating the original purchases into the various cuts of meats and kinds of by-products it is fundamentally necessary that we have accurate weighing at all points of manufacture and distribution.

Weighing equipment must be selected to contend with varying operating practice, moist and damp atmospheric conditions, and the corrosive effects of salt. These factors, along with the variety of products handled, result in the use of scales of several different types. Many of the scales we use are in common use in other industries. Others are modifications of sufficient physical strength to withstand the severity of our service.

The packing industry is so varied in its operation that we find use for nearly every type of weighing equipment, including the following: even balance, beam, spring, automatic, and scales equipped with the "weightograph" attachment, also displacement-type fillers for liquid and semi-liquid product; and the so-called pneumatic type filling machines, operated in conjunction with check-weighing scales. For special conditions we use such scales as the four-poster or suspension scale, special beam scales, and rail scales.

A paper presented at the 22d National Conference on Weights and Measures.

Scales are classified naturally into three groups. Group No. 1: Those used for the weighing of purchased product, as exemplified by cattle scales, hog scales, railroad, and truck scales. Group No. 2: Scales used for the transfer of products from one department to another, and for use in determination of yields, grading, and department operating costs. Group No. 3: All scales that are used for weighing and checkweighing product as it leaves our plant for distribution and consumption.

Fig. 1 illustrates a type of scale included in group 1 used for weighing cattle in the Union Stock Yards, Chicago. The scale shown here is used for determining the weights of small lots of cattle. Larger lots of stock are weighed on a similar scale having capacity for 60 to 70 cattle, and a capacity of about 100,000 lb. The same type scale is used for obtaining the weights of hogs.

The scales used for weighing cattle and hogs are of the platform type, using a recording-type beam. A record of the transaction is made on a weight ticket. After the stock have been driven on to the scales and the beam balanced, this ticket is inserted in the beam, and the weight stamped on the ticket. This eliminates errors due to the recording of incorrect figures and the inability of other people to read the figures set down by the scale man.

As stock comes off the scale it is inspected by the weight taker, who makes note of the number of animals for which, according to the rules of trading, it is permissible to deduct a weight allowance. Should the allowance on weight be disputed by either the buyer or seller, the stock is then inspected by the chief inspector, who is employed by the Live Stock Exchange. A final appeal can be made to a standing committee. The committee is appointed by the Live Stock Exchange, and a nominal charge is made for service rendered.

Railroad scales are used to a small extent for the weighing of such products as coal, feeds, and oils; and truck or wagon scales are used for weighing small lots of feed, building and mechanical materials. In the weighing of product in railroad cars, some discrepancy may result due to such complications as the changing of atmospheric conditions, causing gain or loss in the weight of product, or losses of product in transit. These discrepancies are taken into account by weight allowances that have been agreed upon by the buyer and seller of the product.

Our cars are weighed light for tare weight at stated intervals, and if there is a discrepancy in the stenciled weight on the car, it is immediately corrected. When handling railroad cars during bad weather conditions, they are carefully cleaned and cleared of snow before obtaining weights.

We pass now to group 2. This group, as explained, consists of those scales used for interdepartmental work. Even though these weights are not applied to finished product, it is highly important from the standpoint of department cost, yields, and the like, that weights be accurate. However, those scales used for the purpose of separating product by weight merely for internal convenience need not be accurate to the last degree, but should be adaptable to rapid weighing, as all time spent by the operator in waiting for the scale to balance represents a direct labor cost.

A case in point is the weighing of dressed beef while on a moving conveyor rail. The two halves of beef are weighed together, and a weight ticket, along with the lot number is attached to the beef just before it passes into the cooler. Weights at this point serve both as a check on the carcass yield obtained and on the grading of the buyer. At this point the beef carcass is wrapped in a cloth. This cloth when saturated with moisture weighs about 1½ lb., and is used for keeping the surfaces of the beef smooth during chilling. It is understood, of course, that weights so obtained are not shipping weights.

The weighing of hogs after dressing operation is very similar to that of weighing beef after dressing, and the weights again serve as a means for checking both the carcass yield and the accuracy of grading on the part of the hog buyers. Again, the product is weighed on a moving conveyor rail. Scales must be so installed as not to be influenced by the vibration of the rail along which the carcass passes. We are using at this point an automatic type of beam scale for showing the weight of product, and the operator records this weight on a slip of paper by means of an adding machine. Thus he has at all times the total weight of product that has passed

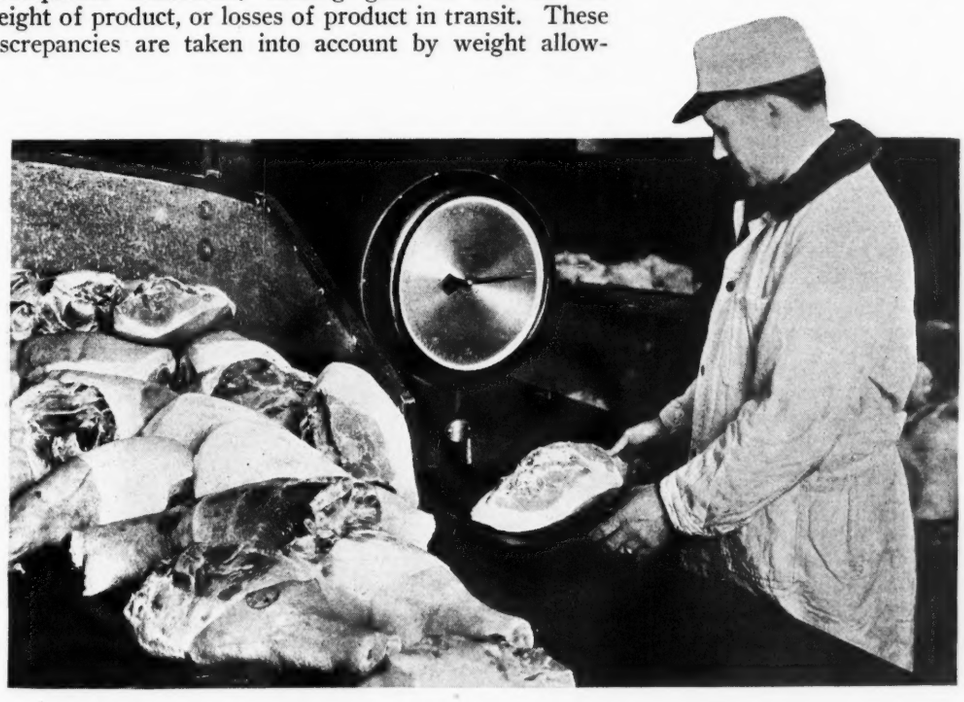

Fig. 2 — For grading hams according to weight, a temperature-compensating spring scale is used. As weight differential between grades is about 2 lb., rapid response, rather than absolute accuracy, is the most desirable characteristic

Fig. 3—The large distance through which the indicator passes for a slight change in weight makes this over-and-under balance particularly suitable for rapid weighing of 1-lb. lots of sliced bacon. Weight of the pans is carefully and frequently checked

the scales, and at the close of each lot has figures immediately available on total dressed weights.

For grading hams we use a temperature compensating spring scale that responds rapidly and gives fairly accurate weights. This type of scale, shown in Fig. 2, is particularly adaptable to service in coolers. Hams are graded according to weight and quality, in order to obtain uniform curing results. As weight differential between two grades is about 2 lb., an error of less than $\frac{1}{4}$ lb. would not be serious.

Another type of scale, used for weighing beef cuts, is the result of experimentation by our scale organization, and is adaptable to the needs of a number of departments in our plant. This scale is used where it is necessary to weigh product either in barrel containers or in trucks. The weights may be used either for product coming into the department or product being shipped from the department. Of course, all product shipped from our plants is check weighed at some point, and in this particular case the check weighing is done on our loading docks.

Group 3 consists of those scales used for weighing and check weighing of finished product, preparatory to distribution to the ultimate consumer. Naturally, it is very essential that we have accurate weighing at this point. We, therefore, make it a policy to checkweigh every article before shipment to the points of distribution.

Fig. 3 shows operators weighing out 1 lb. of sliced bacon, with an over-and-under even balance scale. The product is sliced in the room to the rear of the illustration, and passed through the opening in the wall on to the lower moving conveyor preparatory to weighing. The pans used for holding the sliced bacon all weigh exactly the same, and pans are checked periodically to assure accuracy in their weight. This type of scale serves as an excellent means for weighing this kind of product, due to its sensitivity and the large distance through which the indicator passes for a slight increase or decrease in the weight of the product in the pan.

We also use the automatic no-spring type of scale for weighing sausage preparatory to shipment. The wooden container rests on a platform beside the scale, the order being pasted on the front side of the container. The man then refers to his order, selects the proper sausage from the adjoining pans, weighs the product, and packs it.

The use of a portable beam scale for weighing tierces is shown in Fig. 4. This scale is not expensive. It is simple, easily repaired, and, being movable, is adaptable to service at various points in our plant where tierces or barrels are shipped. This is an old type scale with which all are familiar, and serves to illustrate the continued use and adaptability of such simple equipment to our weighing requirements.

The process of filling containers with cheese and

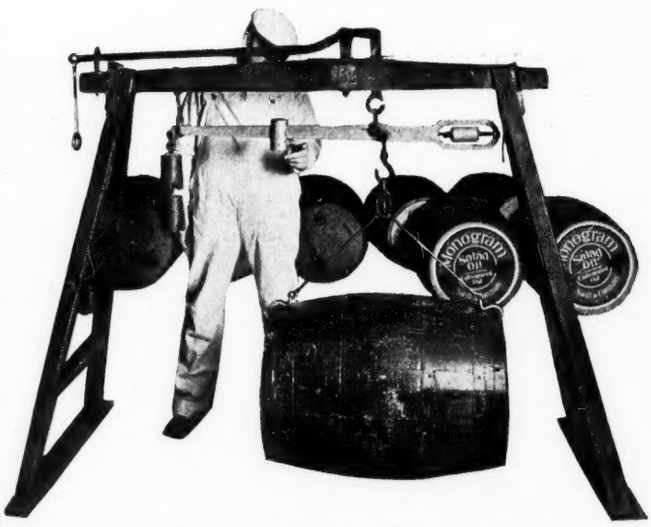

Fig. 4—The familiar portable beam scale used for weighing tierces illustrates the continued use and adaptability of such simple equipment

Fig. 5 — The machine at the left fills containers with cheese and automatically regulates weight by displacement. At the right, a sufficient number to guarantee accuracy are checkweighed on a sensitive balance

weighing by volume or displacement is shown in Fig. 5. This operation is performed by the machine. The product is fed over to the adjoining roller conveyor, where a sufficient percentage is checkweighed to assure accuracy. This method of filling and weighing cartons is used on similar products not only in our industry but in a number of industries where the product is handled either partly or wholly by automatic machinery.

The depreciation we experience in our weighing apparatus is largely due to the conditions under which we operate. On the killing floors, for example, our scales are subjected to excessive conditions of moisture, and close supervision is necessary. Scales used in salt cellars, curing rooms, or hide cellars are subjected to conditions causing rapid corrosion of the metallic parts. Such conditions also affect the accuracy, necessitating continual checking and maintenance of this equipment.

We estimate that about 24,000 pieces of weighing equipment are in service in all of our plants and branches. The Chicago plant alone maintains an organization of twelve men who devote their entire time to maintenance and testing of scales. Scales are tested in accordance with the requirements of the particular service to which the scales are subjected. Such scales as the 1-lb. sliced-bacon scale, and the 1-lb. lard-checkweighing scale are checked for accuracy hourly. It is necessary that we check the accuracy of a large number of scales daily. These scales relate primarily to those departments dealing with the selling. Scales used for weighing smoked meats, sausage, fresh pork, canned hams, dried beef, butterine, lard, and cheese are tested daily. Scales used for weighing dressed beef, pork, sheep, and calves, also are tested daily. Scales used for interdepartment work are tested weekly. Railroad track scales are tested monthly. Some branch-house scales are tested daily, but all branch-house scales are tested at least twice each week.

Scales that are subjected to adverse conditions are tested as often as the condition requires. The scales we use in our salt and hide cellars practically require daily attention, in order to prevent excessive corrosion and to maintain accuracy in the weighing operation. In order to insure accurate weighing and checkweighing, we have in use in our Chicago plant a test balance to calibrate our test weights.

The nature of the products we handle is such that the question of shrinkage is a matter of considerable importance. When live animals are weighed and immediately reweighed a shrinkage in weight is shown to have occurred. The same thing holds true through practically all operations, due, of course, to the natural evaporation of moisture from the meat. Our practice is to consider as an element of cost such shrinkage as occurs up to the time of weighing for final shipment. The merchant who buys from us must, of course, also take into account in his costs such shrinkage as occurs between the time the meat leaves our hands and the time it leaves his hands. This is the only practicable way of handling this problem. The shrinkage which will occur under any given set of circumstances cannot be anticipated, although on the average it will be found to run fairly uniform.

In the case of articles such as dry salted meats, of course, allowances are made for the salt adhering to the product at the time of shipment. Allowances are made also for the amount of pickle present in sweet-pickled meats. These allowances are based on tests, taking into account the time allowed for drainage, and the figuring is done according to the rules of the Chicago Board of Trade.

As to personnel, we are continually developing men in our scale department for the duty of testing and maintenance work on scales. Such training work requires considerable time and experience and is carried out under the supervision of competent scale men. The training of personnel in the operations of weighing product is carried out under a similar plan. The newly appointed operators are instructed by a competent person in the department. All of the factors in connection with the particular scale are explained and illustrated, and the actual work of the new operators is carefully supervised until they become proficient in the duty.

Economical Materials Handling Features

[PART II]

GELATINE MANUFACTURE

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DELIVERY of the filtered gelatine liquor is made to one of another battery of four 6-ft., 3,200-gal. glass-lined receiving tanks, the solution now being crystal clear and ready for evaporation down to a suitable concentration. Evaporation is carried out in Swenson double-effect evaporators constructed entirely of aluminum, shown in Fig. 7. From a 2-per cent solution sufficient water is removed to produce approximately a 15-per cent solution, which is about as concentrated as can be handled with safety. The danger inherent in the more concentrated solutions is that they solidify in pipe lines too easily when slightly cooled and, therefore, from the evaporators onward until the gelatine is spread on the belts for solidifying, it is necessary that all pipe lines be equipped with steaming valves, so that in case of solidification the lines can be easily heated and the gelatine liquefied.

Evaporation is carried out under a 24-in. vacuum in the second effect. In this plant we are doing a thing which has been said to be impossible, in that the gelatine is pumped from the evaporators by a centrifugal pump, shown in Fig. 8. This pump which will be recognized as a LaBour 2-in. self-priming, motor driven, centrifugal, is removing the concentrated liquor from the evaporator against a 24-in. vacuum. Those who formerly thought that it would be impossible to use a centrifugal pump for this purpose based their opinion on the fact that gelatine solutions foam very easily; but by proper handling of the pump and keeping the glands tight we have experienced no trouble.

From the evaporators the LaBour centrifugals deliver the concentrated gelatine liquor to another battery of glass-lined receiving tanks, of which there are two. As stated previously, this number of receiving tanks is necessary in order to keep each lot separate. Either the temperature during the cooking process or the effect of concentration during evaporation may cause the precipitation of a certain quantity of organic matter in the liquid, which necessitates refiltration through a second pulp filter to produce a clear gelatine. This is done by centrifugal pumping of the concentrated liquid through the filter-mass and into a tank in one of the last series of

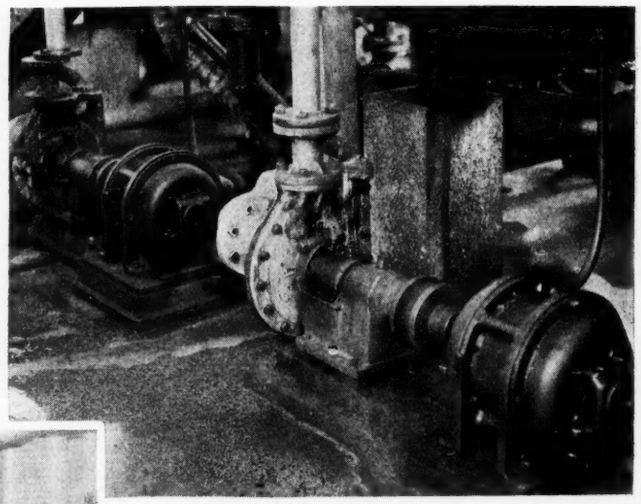

Fig. 8—Accomplishing the impossible! A self-priming centrifugal pump drawing a 15-per cent gelatine solution out of the second effect evaporator against a 24-in. vacuum. Tight glands and self-priming ability are essential

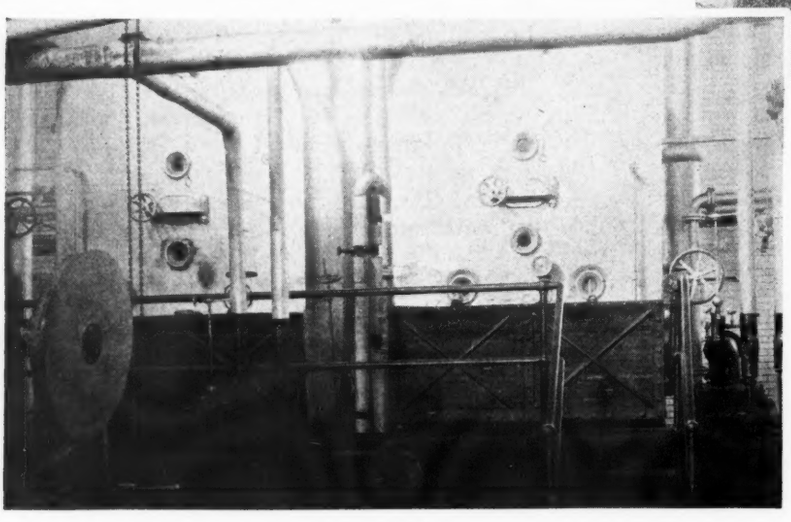

Fig. 7—Double-effect vacuum evaporators made entirely of aluminum concentrate the 2-per cent liquors to a 15-per cent gelatine solution, after which it must be filtered again

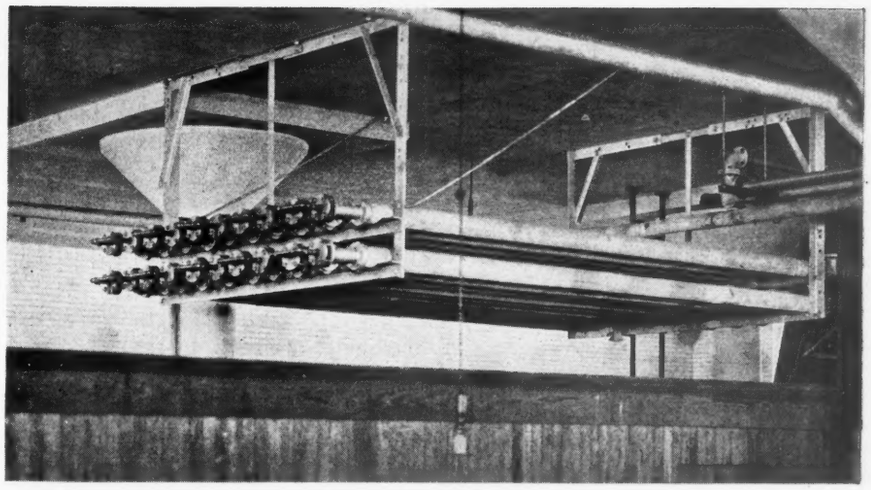

Fig. 9—Cooling the gelatine in an adaptation of the tubular dairy cooler. The apparatus hangs from the ceiling over the spreaders

four receiving tanks. From these tanks the warm gelatine liquor is pumped to coolers situated above the spreading machine, shown in Fig. 9.

These coolers are an adaptation of the ordinary type of dairy cooler; in fact, close observation around the plant discloses many items of equipment that are borrowed from the dairy industry. Reference to Fig. 10 shows a pipe line equipped with sanitary fittings such as are seen in any milk factory. The function of the cooler is to reduce the temperature of the gelatine solution sufficiently so that it may be chilled to solid form with very little further cooling. The desirability of employing sanitary dairy piping at this point lies in the fact that a 15 per cent gelatine solution when cooled almost to its solidifying point may occasionally solidify in cases of delays or sudden temperature drops. For that reason a pipe that is easily disconnected for warming and washing out is a desirable feature.

The spreading machine is merely a continuous belt with a ridge on each edge, as shown in Fig. 10, on which the cooled gelatine solution is deposited from the two pipes extending downward from the horizontal pipe at the top of the picture. The large belt moves forward into the box-like structure at the rate of about 10 ft. per minute and the flow of gelatine is so regulated that it deposits an even layer about ½ in. deep on the belt. The inside of the box is refrigerated, thus causing the layer of gelatine to come out at the other end in a congealed condition, as shown in Fig. 11. In warm weather it is necessary to have recourse to mechanical refrigeration, but in winter it is necessary only to draw in the outside air when it is below a temperature of 40 deg. F. and sufficient cooling will result. When it is warm outside the blowers that communicate with the outdoors are shut off and the ammonia refrigeration machine is started. Utilizing the outside temperatures in this manner makes possible a very perceptible economy in the power bill.

The cooled gelatine is stripped from the belt in the manner shown in Fig. 11. The belts are about 3 ft. wide, making the sheet a little too wide for operators to handle conveniently when it has been dried. For this reason the wide sheet is cut in three narrower strips by the rotary cutters shown in the central part of the picture. Because of the fact that gelatine has a rubber-like consistency it is deposited directly upon wooden drying racks covered with 1-in. mesh Monel metal netting. The racks rest on the conveyor to be seen in the foreground of the picture, the motion of which is at the same

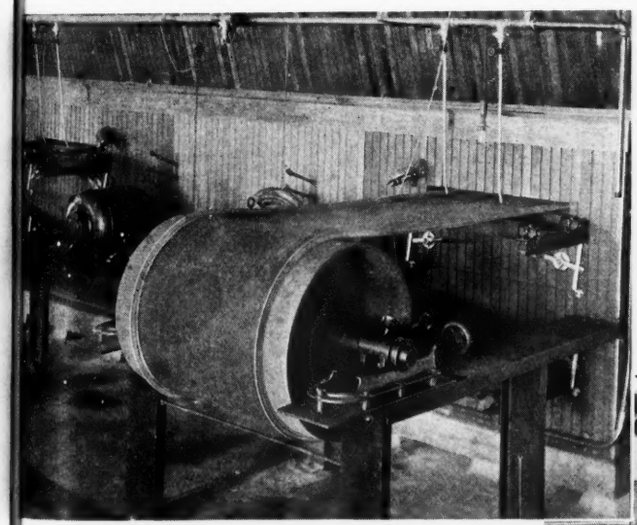

Fig. 10—Head end of the spreading machine. A cooled, but not congealed, gelatine solution flows on to this moving belt and enters the refrigerated space inside. Note the sanitary piping, so familiar to the dairy industry; and the ridges at the edges of the belt

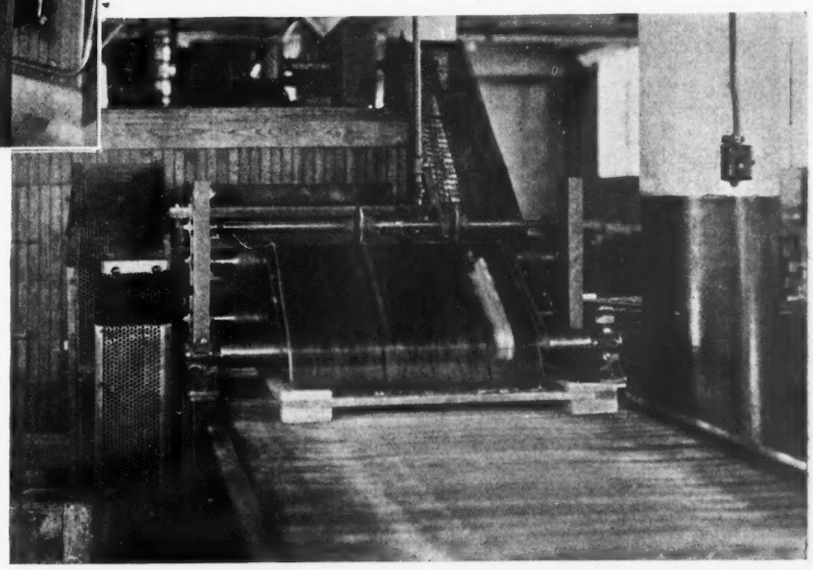

Fig. 11—The half-inch film of congealed gelatine emerges from the tail end of the spreaders, is cut into three strips by wheel cutters, and falls on the drying racks on the rack conveyor at the rate of about 15 ft. per minute

Fig. 13—Ends of the drying tunnels are always open. A load of wet gelatine is about to enter the door from the spreader room. Note the adjustable louvers above the tunnels

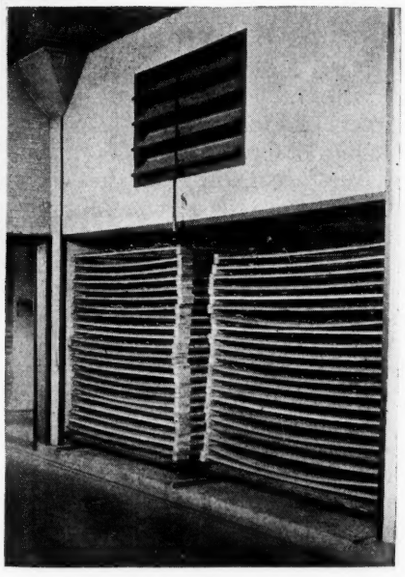

Fig. 14—The drying system has been so designed that the racks will nearly fill the cross section

rate as that of the chilled gelatine from the spreading machine. As soon as the rack passes beyond the end of the descending film, the gelatine is cut off with a knife in the hand of the operator and another rack follows immediately. Moving the racks on and off the rack conveyor, as well as cutting the gelatine sheet, is, of course, a manual operation.

Loaded racks are stacked vertically on trucks of the type shown in Fig. 12. By referring to Fig. 13, a pile of the racks can be seen on its transfer car at the background, where it is ready to pass from the spreading room into the drying room. An important feature of the materials handling at this point is the fact that the track on which this truck runs is depressed below floor level in such manner that when it is brought in place before the proper drying tunnel it can be pushed off very easily, as shown in Fig. 12. The pile of racks rolling on casters is then pushed to the back of the tunnel.

Drying tunnels are never loaded as full as is shown in Fig. 14. This picture is merely to illustrate the manner in which the piles of drying racks practically fill the whole opening of the drying tunnel. The tunnels are slightly longer than is absolutely necessary and if they are overloaded those frames that are farthest from the heating coils will be in contact with air that is nearly saturated and the drying will be so slow that bacterial spoilage of the gelatine may occur.

By reference to Fig. 15, the layout of the drying tunnels with which this plant is equipped can be seen and the flow of material through the drying department can be traced. An important feature which has been carefully worked out in this plant is the absence of any back-tracking or confusion of material. Everything moves forward at all times and it is an excellent example of straight-line production, although the movements are not in geometrically straight lines, as can be seen in the method of getting the material from drying tunnels out to the back ends.

All steam traps and operating valves and temperature controls are placed in small depressions in the walls of the transfer bays. The location of this equipment is not indicated in Fig. 15, but it is adjacent to the heating coils. The walls of the tunnels are bent inward at an obtuse angle that permits easy placement of the traps in such a manner that they are readily accessible to workmen and yet will clear a transfer car and its load when moving down the transfer bay.

In drying the gelatine a great deal of care has been exercised at this plant to put out a product without impurities. The moist surface of drying gelatine would, obviously, catch and hold any dust or dirt or insects in the surrounding atmosphere. For that reason it has been necessary to use filtered air in the drying room. The location of these filters, shown in Fig. 15, is just ahead of the heating coils. Under normal weather conditions the drying operation requires 16 hours. After the first 5 to 10 hours, when the heaviest percentage of moisture has been removed, a portion of the air is recirculated. By this method a considerable economy of fuel is effected,

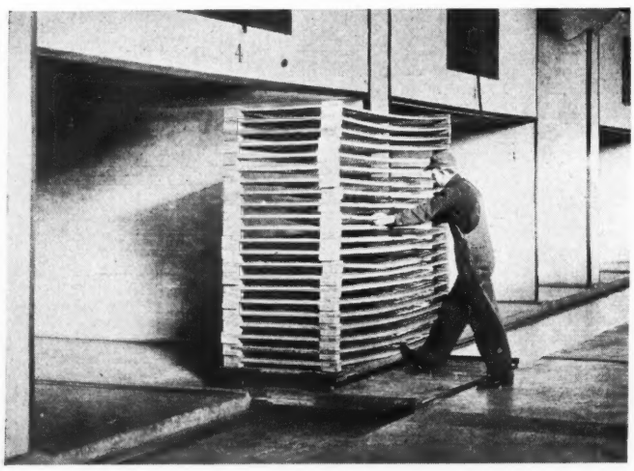

Fig. 12—Pushing a load of racks of wet gelatine from a transfer car into a drying tunnel. A bulky pile is easily handled in this manner. Note the depressed track for the transfer car and the angle iron rails for the caster truck

for the hot air blowing out of a tunnel containing partially dried gelatine, is so far from being completely saturated that it will take up considerably more water. The movement of the air that is recirculated is most easily followed in the flow sheet published in the June issue of FOOD INDUSTRIES on page 260.

By referring to Fig. 13 it will be seen that certain of the louvers above the drying tunnels are open and some are closed. Those that are closed are above those tunnels in which the air is being forced through and out the open windows on the right. Where it is desired to recirculate some of the air the louvers are opened in the manner shown in tunnels 5 and 6, in Fig. 13, or in tunnel 8, in Fig. 14.

The dry gelatine consists now of sheets about 6 ft. long and 12 to 16 in. wide, lying on racks as shown rather dimly in Fig. 14. The trucks carrying these frames are pushed out at the back of the tunnels and are moved across the floor to the breakers. Here sheets of gelatine are laid on a 1-ft. mesh pipe frame and beaten by workmen with rods until the particles are small enough to fall through into a crusher shown below, which breaks the gelatine still further into pieces not more than 1 or 2 in. in their greatest dimension, and drop them into barrels beneath.

It must be remembered that each batch of gelatine going through the plant must be kept separate, because of the necessity of very accurate control and of supplying the trade with gelatine of uniformly definite characteristics. Thus, when the crushed gelatine is dropped into barrels, the entire lot is segregated at some point in the warehouse.

Most orders calls for a pulverized gelatine, rendering necessary a grinding operation. The barrels of broken gelatine from a given lot are dumped into an elevating conveyor, which conveys the material to an impact grinder. The ground gelatine then passes over Taylor or Sturtevant sifters which return the oversize particles to the grinder, the sifted material being run into barrels, that are then shaken down and headed up. All the barrels of a given lot are again segregated and marked in an appropriate manner.

A certain amount of hand work seems to be inevitable in the manufacture of this product, but the heavy work is done mechanically. In the liming department the clamshell bucket operated from a crane makes it possible to handle huge quantities of material at a surprisingly low cost; where the product is in liquid form it is easily handled by pumping; and the carefully planned system used in the spreading and drying department makes the cost of movement of the bulky drying racks an extremely small item.

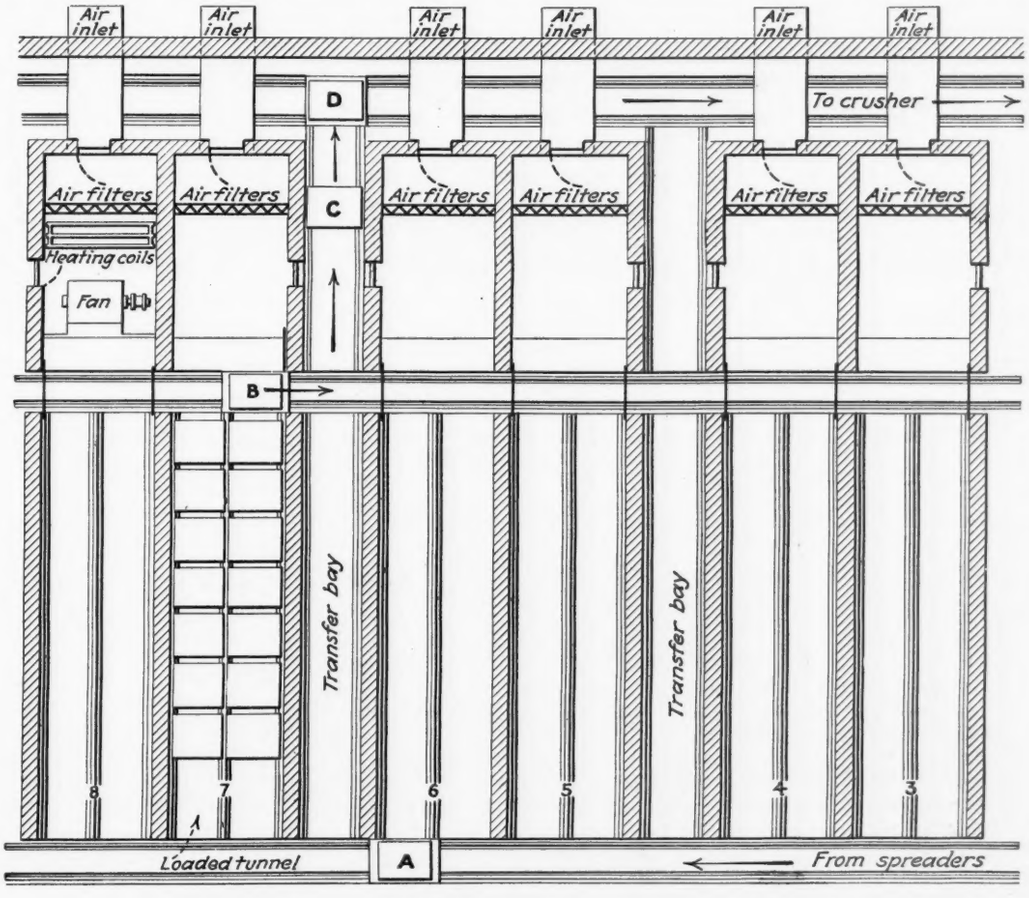

Fig. 15—Layout of the tunnel drying system showing how straight-line production has been provided. Each unit has two tracks. Transfer bays between pairs of tunnels are an extremely important feature. *A* is a transfer car of wet gelatine in position to load one side of tunnel No. 6. *B* is a transfer car in the cross bay ready to unload tunnel No. 7. *C* is a load, rolling on casters, moving down transfer bay from car *B* to car *D*. *D* is a transfer car moving load of dried gelatine toward the crushers

Abstracts of Current Literature

THERMOMETRIC OIL ANALYSIS. Takayuki Somiya. *Journal of the Society of Chemical Industry* (Japan), Vol. 33, pp. 174-6B; May, 1930.

The heat liberated in the combination of unsaturated fatty acids with chlorine can be utilized in a thermometric method for determination of iodine number of oils and fats. The end point is not sufficiently sharp with the Hanus or Rosenmund solutions, nor with acetic acid solutions of iodine or bromine; but with chlorine in acetic acid a sharp end point is obtained. A procedure is described for making the determinations. An experimental comparison of this method with the Hanus and Rosenmund methods shows satisfactory agreement, with a tendency for the thermometric results to be slightly low, especially with highly unsaturated fats or oils. A table of data is given, showing application of the method to coconut oil, tallow, tsubaki, and the oils of the olive, rapeseed, peanut, and soy bean.

* * *

ENZYMES OF GREEN MALT. R. H. Hopkins and J. A. Burns. *Journal of the Institute of Brewing*, Vol. 36, pp. 9-15; January, 1930.

An investigation has been made to ascertain whether or not two distinct proteolytic enzymes can be detected and differentiated in green malt. It was readily shown that a protease is present which attacks crystalline egg albumen and also degrades Witte's peptone. Attempts to fractionate this protease, however, did not succeed; that is, storage under varying conditions of temperature and pH did not separate the protease into different components. The protease is destroyed by alkali and by excess of acid, its optimum pH when stored as malt extract at 40 deg. C. being about 4.4 to 5. This is near the isoelectric point of the proteins of malt extract. The protease is also quite heat-sensitive, being very much reduced in activity if heated for 10 minutes at 62 deg. C. at its natural pH. For this reason, conditions encountered under commercial mashing conditions may be expected to destroy the enzyme. Even though the fractionation experiments failed, other evidence was obtained which reveals the presence in green malt of a peptidase which has its optimum pH on the alkaline side, and which is very sensitive to heat, being destroyed in 3 hours at 26 deg. C. at a pH of 9. This extreme sensitivity doubtless is related to the difficulty of proving the presence of the peptidase.

VITAMIN POTENCY OF RICE. J. P. Spruyt. *Chemisch Weekblad*, Vol. 27, pp. 298-304; May 17, 1930.

The phosphoric-acid content of rice is not a reliable criterion of the potency of the rice against beri-beri. A colorimetric method has been developed, and tested with great care in parallel comparison with animal feeding tests. Final confirmation has not yet been obtained, pending the outcome of the last of the animal-feeding test series; but the results indicate that the color test agrees well with the animal tests, and can be used as a control test for maintaining the vitamin potency of rice and its products. The technique of the test is described in detail. A phosphotungstic-acid reagent is used. In its present form the test is somewhat tedious, but time-saving refinements of the method are being investigated. The ultimate object is to arrive at a definite color standard, to which a sample must conform to be passed as having satisfactory vitamin potency. The results so far obtained indicate that the goal has very nearly been reached, but confirmation is awaited. Numerous tables of numerical data are given, showing the comparative results of feeding tests and the colorimetric test.

* * *

BACTERICIDAL PROPERTIES OF MILK. S. Orla-Jensen and Johanne Jacobsen. *Zentralblatt für Bakteriologie*, Vol. 80, pp. 321-41; March 24, 1930.

It has been found that milk contains a bactericidal agent which retards the growth and acid-forming activity of most of the Streptococcus organisms and other lactic-acid bacteria. This substance is thermo-labile, being totally destroyed at 70-75 deg. C. It seems to have no potency against thermophilic bacteria of the type which can form laevo-lactic acid. Among the practical aspects of the presence of this substance in milk are its effects on production of dairy products. For making yoghurt and like products, it is best to use raw or sterilized milk; acid formation is slow in milk pasteurized by ordinary methods. In Bulgaria, yoghurt is made from boiled or even from evaporated milk. Acid formation follows a different course in products in which the lactic-acid organisms predominate; in these only the prolonged pasteurization at 63 deg. C. is harmful. Acid forms quite rapidly in highly pasteurized milk, and application of the lower pasteurization in butter making would serve only to increase the troubles already encountered. Purity campaigns in dairies alleviate the butter maker's troubles somewhat, and are even more helpful to the cheese makers. Purer milk is not only more free from the organisms causing defects in butter and cheese; it is also more appetizing and more desirable from the hygienic standpoint. But in using high-grade pure milk, in which the potency of the bactericidal substance is at its best, cheese makers should not assume that all the organisms needed for their processes are present; they should make tests, and use pure cultures of selected strains of bacteria for inoculation of the milk to supply any deficiencies.

* * *

YEAST GROWTH. Franz Marboe. *Zentralblatt für Bakteriologie*, Vol. 81, pp. 67-73; May 20, 1930.

The growth cycle of yeast cells is so sensitive to composition of the medium that no substance has yet been found which, if appreciably soluble in the substratum, does not influence the growth cycle. The effect of like concentrations varies widely among the metals; it is strong for copper, silver, cadmium, mercury, and chromium; medium for zinc, aluminum, tin, lead, and nickel; weak for magnesium, bismuth, manganese, and iron. The actual effect of any metal is a function of its specific effect and also of its solubility. At certain small concentrations the metals stimulate yeast growth; at larger concentrations they become poisons, retarding growth. The effect of a metal is weakened by boiling the medium in which it is contained; exposure of a clean surface of the metal in the medium enhances the effect of the dissolved metal. The influence of a metal is due partly to toxic action of its salts, and partly to oxidation or reduction effects on the nutrient medium. Owing to the great influence of kind of metal and concentration, use of metals as an aid in the commercial production or use of yeast is a delicate matter, requiring careful adjustment and control but yielding beneficial results. One factor which must not be neglected is the amount of storage of metal in the yeast cells. Metals that give dependable results if properly used in commercial practice are copper, silver, aluminum (or tin), chromium, nickel, platinum, and chrome steel. Great care must be exercised so that the maximum permissible concentration will not be exceeded.

* * *

VITAMINS AND THE FOOD INDUSTRY. A. Bakke. *Chimie et Industrie*, Vol. 23, Special Number, pp. 516-8; March, 1930.

In the testing of food products for vitamin potency there is no reliable chemical method; final reliance must be placed on biological tests. The colorimetric test with antimony trichloride (for vitamin A) is considered in England to be equal to or even better than animal feeding tests, but experience shows that extreme caution is necessary in the interpretation of the color test. Rats are suitable for testing

vitamin A, provided accidental occurrence of this vitamin in the basal diet is excluded. Rats are quite satisfactory also for growth tests with vitamin B; but pigeons are preferable for testing the anti-neuritic properties of vitamin B. Guinea pigs generally are used to test for vitamin C potency (e. g., in sweetened condensed milk), but the investigator must remember that the acceptable diet range for the guinea pig is much narrower than for the rat, and must use great care to prevent this limitation from introducing errors of interpretation. Practical experience with tests for vitamin D potency has revealed discrepancies which have not yet been explained. Owing to the rapid advances being made in biology and physiology, active research on vitamins is necessary; the technique which serves adequately today will be inadequate tomorrow. Other countries should profit by the example of Norway, where a laboratory devoted specifically to vitamin research is maintained under the direction of Prof. E. Poulsson.

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JAPANESE FISH OILS. Masawo Hirose. *Journal of the Society of Chemical Industry* (Japan), Vol. 33, pp. 172-3B; May, 1930.

Results from the 1929 catch of fish in Japanese waters confirm studies of fish oils from the 1927 catch. These studies included the oils of sardine, herring (small and large), plaice, salmon, sand eel, and liver oils of cod, Alaska pollack, and common ray. The sardine oil showed the highest iodine number, refractive index, and specific gravity in sardines from Japan proper; these properties showed the lowest values in sardines from Chosen, those from Hakkaido being intermediate. Pure large herring oil has iodine numbers from 96 to 110. Alaska pollack liver oil is much like cod liver oil, but its iodine number, refractive index, and specific gravity are slightly lower. A table is given, showing the specific gravity, acid number, saponification number, iodine number, refractive index, and unsaponifiable matter for the oils named above.

* * *

ALUMINUM IN THE PRESERVING INDUSTRY. C. Bidault and Suzane Blaignan. *Rev. hyg. méd. prév.* Vol. 52, pp. 122-8, 1930; C. A. Vol. 24, p. 1675, April 10, 1930.

Possible substitution of aluminum for iron-tin cans for food preservation is discussed. Meat with a little salt was experimentally canned and stored, and examined from time to time for a period of 8 months. At 8 months the aluminum in the meat and broth was insignificant, varying from 0 to 0.0145 gram per 100 grams. The pH of the broth was varied from 4.5 to 8 without significant effect on the container. Aluminum as a can material is attacked by meat with salt to a significant degree only after very long exposure. Before aluminum is used indiscriminately in the food industry, its innocuousness should be irrefutably established.

ACIDITY AND CORROSION IN CANNED FRUITS. E. F. Kohman and N. H. Sanborn. *Industrial and Engineering Chemistry*, Vol. 22, pp. 615-7; June, 1930.

The worst perforating fruits are those with lowest acidity or highest pH. Addition of small quantities of citric acid to sweet black cherries inhibited the tendency of the cherries to perforate the can. Dehydrated prunes (pH of 4) are far more corrosive in a can than fresh prunes (pH of 3.6). Although the degree of difference in acidity or pH is not so large, there is a much greater difference of electrical potential established between the iron and tin, and there follows a corresponding increase of corrosive action. The effect of the addition of varying quantities of acid and alkali upon the corrosion tendency is further discussed, with presentation of nine tables of data.

* * *

"RED SPOT" IN CHEESE. J. G. Davis and A. T. R. Mattick. *Zentralblatt für Bakteriologie*, Vol. 80, pp. 30-3; Jan. 22, 1930.

A common defect in English hard cheese is the occurrence of red or rusty spots throughout the cheese. These appear chiefly from April to September, in 3 to 6 weeks after manufacture, in very small orange to bright red spots, which are not the same as the more diffuse pink or brown stain caused by a Gram-negative organism producing acid from dextrose only. A careful bacteriological study has therefore been made of the organism responsible for the red spots. The spots are found to be practically pure cultures of a small non-motile, non-capsulated, and non-sporing organism which shows hardly any growth unless kept under anaerobic or micro-aerophilic conditions. Its ability to produce pigment anaerobically distinguishes it sharply from the usual types of chromogenic bacteria, which require oxygen for pigmentation. Except for its pigment, the organism would be classed as a lactic-acid bacterium. Several observations indicate that presence of vitamin B is an essential factor. Occurrence of the spots in cheese is mainly in moist pockets left by fractures of original pieces of curd. Further studies of the defect and its treatment, as made by the British National Institute for Research in Dairying, are reported in Vol. 1 of the *Journal of Dairy Research*.

* * *

STUDIES ON THE DESTRUCTION OF VITAMIN C IN THE BOILING OF MILK. E. W. Schwartze, F. J. Murphy, and R. M. Haun. *Journal of Nutrition*, Vol. 2, p. 325; March, 1930.

Milk was boiled for 5 minutes and showed a loss of vitamin C amounting to about 20 per cent. There was no detectable difference in the destruction of vitamin C between boiling milk in aluminum and boiling in glass. If glass be taken as an inert standard, it is certain that no detectable catalysis by the aluminum is evident.

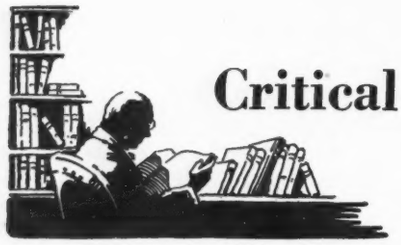
MAYONNAISE. W. M. Brownell. *Oil and Fat Industries*, Vol. 7, p. 99; March, 1930.

Malt sugar is a useful component in mayonnaise preparations, because it is a rich, easily assimilable food and is a good source of vitamins B and C. It also contains vitamin A. Experiments in mayonnaise compounding with and without malt sugar have revealed the fact that better resistance to heat, freezing, shaking, and the wagon test are obtained in the malt sugar recipes than in those without it. Mayonnaise is very high in calorific value; and malt sugar, also ranking quite high, contributes more in this respect than does cane sugar. Easy digestibility and relatively low sweetening power are additional factors favoring the use of malt sugar, in that they permit the use of larger proportions in a recipe than would be permissible with cane sugar. For the compounding experiments a basic formula was used, in which the proportions are: vegetable oil, 79.5; whole egg or yolk, 6.1; malt sugar, 4.1; white distilled vinegar (50 grain), 9.2; mustard, 0.6; and highest grade salt, 0.5 per cent. The total beating time was 8 minutes; the test recipes were made up on a 30-qt. machine. Oil flow was adjusted to 8 minutes by means of a cork with a hole of suitable size. By adhering to this controlled procedure, variables in the recipe and its preparation could be controlled so that only one factor was changed at a time. It was observed that the most suitable malt sugar preparation is one, recently put on the market, in which the salt has already been added, so that the powder can be used directly in frozen or liquid eggs. Best results were obtained by mixing this malt sugar with part of the liquid egg (in the proportion egg, 85; malt sugar, 15) before adding it to the mayonnaise mix. Whole eggs are preferable to yolks in this procedure.

* * *

BABASSU FAT. R. Dieterle. *Seifen-sieder-Zietung*, Vol. 57, pp. 224-5; March 27, 1930.

Crude non-edible babassu fat, as pressed from the nuts, has a somewhat rancid odor but is readily susceptible to refining with very small loss if properly treated. Any oil refinery equipped to handle coconut and palm-kernel oils can profitably refine babassu fat, for which the treatment is simpler and the losses are smaller. Free acidity is seldom over 5 or 6 per cent; neutralization is best effected with alkali at 3 to 7 deg. Bé., taking care to keep the temperature not substantially above 100 deg. C. After washing, the neutralized oil should be bleached with one of the milder bleaching earths, such as Frankonite CI, Montana ES, and the like. Small additions of a decolorizing carbon are also beneficial. Deodorization by steaming requires about a ton of steam for a ton of fat. After steaming, marked improvement in flavor is noted as the fat cools. Operating data are reported from three refining plants.



Critical Book Reviews

THE FROZEN AND CHILLED MEAT TRADE. A Symposium. Gresham Publishing Company, Ltd., London, 1929. 2 volumes, 540 pp. Price, 30 shillings.

INTO these two volumes material on almost every phase of the slaughtering, packing, refrigeration, transportation, storage, and sale of chilled and frozen meats has been collected to form a valuable, if rather disjointed, whole. Several of the twelve authors who contributed to the work are outstanding figures in the foreign meat trade, but the connections of some of the other contributors, unfortunately, are not mentioned.

To those with the mistaken impression that the freezing of meats is somewhat of an innovation, the voluminous statistics concerning the hundreds of millions of pounds of frozen beef and mutton shipped to England each year from Australia and New Zealand will be a revelation. To those who may be wondering just what progress is being made on the freezing of consumer cuts in foreign fields, the book will be disappointing, but whether the fault lies as much with the authors as it does with actual conditions is difficult to determine. Only one page is devoted to rapid freezing, and this concludes with the work of Zarotschenzeiff in 1926.

Frequent reference to the fact that chilled meat is gaining in public favor over frozen meat, with consequent difficulties for packers in the Antipodes who must ship over long distances, leads one to speculate on the possibility of applying more modern freezing methods now coming into prominence in the United States. Data contained in the volumes proving that frozen meat is as healthful as the fresh product are interesting from a historical viewpoint, but hardly news to American producers. As indicated in the book, the enormous number of carcasses now being frozen precludes any rapid change in operation, and makes it quite obvious that development must proceed along different lines in those countries where freezing of one kind or another offers the only possible means of getting a large percentage of the production to a market.

Production statistics for both frozen and chilled meats, along with much historical information, make the book valuable for reference purposes. A discussion of meat inspection laws and commercial law governing contracts concerning meats enhances the work from this point of view.

The discussion of refrigeration appears complete, but a trifle elementary for a book of this type. The section on the design and equipment of meat-freezing works and cold-storage plants is detailed and thorough, but several significant differences between American and foreign practice are apparent. Material on the action of freezing and thawing upon the animal tissue is hardly up to the standard set by the historical, economic, and legal sections of the volumes.

Transportation of frozen meats is treated at length, but only that connected with refrigeration at sea, containing Lloyd's regulations and similar information, will be of value to the American reader. An index is provided, but it is hardly comprehensive enough for two volumes containing such a wealth of loosely related information. A large number of excellent full-page illustrations add to the value and attractiveness of the work.

E. SCOTT PATTISON.

ANNUAL SURVEY OF AMERICAN CHEMISTRY. Prepared by the Division of Chemistry and Chemical Technology of the National Research Council. Edited by Clarence J. West, Director, Research Information Service, National Research Council. Vol. 4. Chemical Catalog Company, Inc., 419 Fourth Avenue, New York. 550 pp. Price, $4.

THIS annual survey of American chemistry, in its fourth volume, covers 18 months from July 1, 1928, to Dec. 31, 1929. This period, instead of the customary 12 months, was chosen in order to change the survey from a scholastic-year basis to a calendar-year basis.

The book is a summary of all the research work of a chemical nature done in America during the 18-months period covered. Of special interest to the readers of FOOD INDUSTRIES are the chapters on colloid chemistry, biochemistry, vitamins, foods, water, insecticides and fungicides, and fermentation. By reading these chapters, those who are interested in the chemistry of food manufacture will be able to obtain a well co-ordinated survey of current research work.

Although the volume is prepared primarily for the chemist, production executives will find much of interest and value in the chapters that have been enumerated, particularly the chapter on foods.

L. V. BURTON.

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DOCUMENTS ARE AVAILABLE *at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.*

Confectionery Distribution, by Rupert L. Purdon. Bureau of Foreign and Domestic Commerce, Domestic Commerce Series No. 31, 10 cents. A statistical economic analysis of the business.

Fumigation Reports. Documents issued by the U. S. Department of Agriculture as follows: Control of Insect Pests in Stored Grain, by E. A. Black and R. T. Cotton, Farmers' Bulletin 1483, 10 cents; Effect of Various Fumigants on Germination of Seeds, by H. D. Young, Reprint from Journal of Agricultural Research, Vol. 39, No. 12, Dec. 15, 1929; Fumigation of Citrus Trees for Control of Insect Pests, by R. S. Woglum, Farmers' Bulletin 1321, 10 cents; and Information for Fruit Growers about Insecticides, Spraying Apparatus, and Important Insect Pests, by A. L. Quaintance and E. H. Siegler, 1929 edition of Farmers' Bulletin 908, containing slight changes, 15 cents.

Fisheries Reports. Three Bureau of Fisheries documents as follows: Report of the U. S. Commissioner of Fisheries for the Fiscal Year 1928, with Appendixes—Part II, $1.65, statistical; Statistics of the Haddock Fishery in North American Waters, by A. W. H. Needler, Document 1074, 5 cents; and Destruction of Oyster Bottoms in Mobile Bay by the Flood of 1929, by Paul S. Galtsoff, Document 1069, 10 cents.

Corn Statistics. U. S. Department of Agriculture Statistical Bulletin 28; 25 cents. Gives figures for the year ended Dec. 31, 1928, with comparable data for earlier years.

Red Squill Powders as Raticides, by J. C. Munch, James Silver, and E. E. Horn, Bureau of Biological Survey, U. S. Department of Agriculture, Technical Bulletin 134, 10 cents. A pharmacological study of the toxicity of red squill powders to rats, showing that this raticide, although usually refused by other small animals, is quite effective for rats. One ounce of red squill will kill 7 pounds of rats.

What's on Your Mind?

The Olive Oil Tariff

To the Editor of FOOD INDUSTRIES:

If all of the agricultural rates of the new tariff law have been manipulated similarly to the tariff on olive oil, there is no reason for agriculture to rejoice. The American olive industry demanded an increased tariff on olive oil in order to compete with imported olive oil in its home market, which also would have put the olive canning industry on a paying basis. Our California Senators were fully informed on the subject, but through untruthful statements made by Eastern Senators and passed unchallenged by California Senators, the tariff on olive oil was denied.

The net result is that, possibly on account of the California olive oil industry having made an effort to keep going, foreign governments have subsidized their olive-oil industry so as to enable it to flood the American market with olive oil below its cost of production. Their apparent purpose is to wipe out the American olive-oil industry, thereby increasing the difficulties of the canning olive industry. Canning olives represent only 30 per cent of the crop and this 30 per cent will have to carry the loss on the 70 per cent oil olive crop.

On account of foreign competition olive packers have never been able to press profitably the 70 per cent of oil olives, and consequently quite a quantity of these small oil olives have found their way into the can, thereby demoralizing the market for the regular canning-size fruit. Moreover, under present conditions packers and growers are unable to pay American wages when foreign cheap labor is permitted to enter unrestricted in the form of olive oil, for approximately 75 per cent of the value of olive oil represents labor.

The former tariff on olive oil in bulk was 6½c. per pound and on olive oil in small containers 7½c. per pound (viz. 6½c. on olive oil and 1c. on containers). The requested increase of 10c. per pound was denied by Congress, but Senator Goldsborough of Maryland, who openly stated he had to protect the packing business of his state, where a large quantity of imported olive oil is put up in small containers, sponsored a tariff of 9½c. per pound on olive oil in small containers, which represents 6½c. per pound on oil and 3c. per pound on containers. Three cents per pound equals 24c. per gallon container, and the cost of this container is approximately 8c. The real result, therefore, has been a 200 per cent increase on the containers and *no increase whatever on the olive oil itself.*

The writer thought to bring this matter to your attention so as to correct any erroneous impression which you may gain from the present tariff on olive oil as far as an increased tariff on various kinds of olives is concerned, this does not affect the matter in the least, inasmuch as only a negligible part of the crop is used experimentally for this purpose and consequently does not conflict commercially with imported olives of any description.

E. LUDWIG,
Oroville, Calif. Manager,
Wyandotte Olive Growers' Association.

* * *

Thermophiles in Sugar

To the Editor of FOOD INDUSTRIES:

Previous allegations that cane sugar alone is responsible for the introduction of thermophilic bacteria in canning processes are hardly in accord with the evidence. Some few years ago, Dr. E. J. Cameron of the National Canners' Association investigated several plants where thermophilic contamination caused considerable damage. The results of his investigation led him to believe that cane sugar was the medium of introduction of thermophiles in the canning and the cause of the whole trouble. On the other hand, if you will carefully read his report on page 19, table 6, you will note that peas entering and leaving blancher No. 1 showed no thermophiles. whereas the peas leaving washer No. 1 showed thermophiles as well as the overflow water from the washer. In the same table it is shown that thermophiles are picked up in blancher No. 2. The peas do not come in contact with brine containing sugar until they have left the blanchers and washers, and until the brine has been subjected to a certain amount of sterilization. This table clearly indicates the entrance of thermophilic bacteria at a point previous to contact of the peas with sugar. In other words, the peas or the water are here at fault.

Now, I do not wish to say that there are no thermophiles in sugar any more than to say there are no thermophiles in cocoa, flour, vanilla beans, or any other food material. Perhaps it is to the point to say you will find them in salt and water.

One of the largest canners recently asked me what I thought this whole question of thermophiles amounted to, as he naturally had come across it and been mildly interested. He had seen no occasion to take it up further, for he had never experienced any difficulty from that source. This canner has for years used fine granulated cane sugar, and on a statement of fact he is willing to use coarser granulations, but will not pay a cent more for them. In other words, cane sugar has given him absolute satisfaction. It is pertinent to remark at the same time that his canning plant represents the cleanest, most sanitary canning practice in the United States.

The question resolves itself in my mind to a matter of plant cleanliness and sanitary measures. The thought has occurred to me that when this matter came up the refiners were ill-equipped to answer any such challenge and had the "bone" thrown in their pile with nobody to throw it back. The Spreckels research laboratories have been investigating the question of thermophiles for the past several months in an effort to obtain a well-rounded answer to these questions which have been before the industrial public since 1926.

Thermophilic organisms come under the classification of the soil bacteria; some of them are spore formers and may be found universally in almost every food product except in those cases where they are subjected to complete sterilization and kept hermetically sealed. I think you will agree that the probable answer to the problem will be one of reasonable care and sanitation in the processing of canned goods coupled with an intelligent understanding of what constitutes the relative importance of the various sources of contamination.

Yonkers, N. Y. C. D. INGERSOLL,
Spreckels Sugar Products Laboratory,
Spreckels Sugar Corporation.

(Refer to "The Bacterial Content of Raw and Commercial Sugars" Lawrence H. James, FOOD INDUSTRIES, November, 1928, for bibliography.)

EDITOR'S NOTE

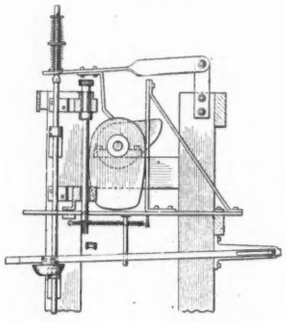
This letter opens up an exceedingly interesting question. It is one that we regard as of considerable industrial importance, perhaps requiring further cooperative effort for its solution. The interpretation given by FOOD INDUSTRIES, on page 98, of the March issue, may be supplemented by the further statement that we believe it is possible for any canner with proper knowledge of his business and adequate cooling facilities to continue to live with ordinary mild thermophilic contaminations in his plant, provided that these bacteria are not given an opportunity to multiply and be the source of gross contaminations. If this were not true the canning industry, particularly the canners of peas, corn, succotash, and other non-acid vegetables, would be out of business.

The mild, even languid, interest of many canners in obscure matters pertaining to their own technologic welfare is so well known that it is almost a tradition.

If there is a difference of opinion as to where the fault lies we believe that a thorough discussion should bring the matter into proper perspective. Perhaps, too, there is new data or results of further research that may modify previous conclusions. FOOD INDUSTRIES will be glad to hear the views of refiners, canners, and food technologists on the whole question.

Selected Patents

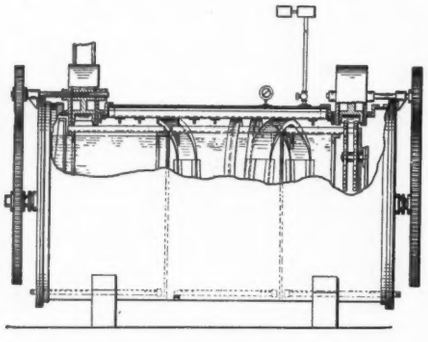
A Feeding Attachment to a Fruit Paring Machine—John W. Pease, Rochester, N. Y. No. 1,752,997. April 1, 1930—The fruit is placed in a cup-like



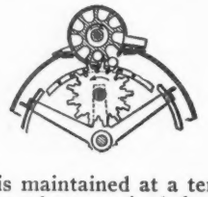
holder attached to an arm that operates in a longitudinal direction to carry the fruit into alignment with the holding and paring members.

* * *

Apparatus for Zone Treatment of Canned Goods—Albert R. Thompson, San Jose, Calif., to Anderson-Barn-Grover Mfg. Company, San Jose, Calif. No. 1,754,532. April 15, 1930.—This is a single apparatus consisting of a plurality of successively communicating com-



partments, and a means for advancing the canned goods through the compartment, and a means for maintaining a definite temperature in each compartment with a pressure sufficiently above atmospheric to prevent interchange of heat between the compartments through their communications. The first com-



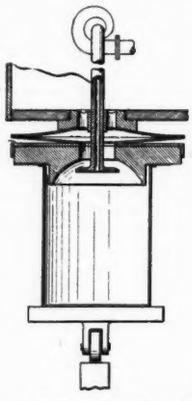
partment is maintained at a temperature higher than that required for sterilization; the second compartment is held at sterilization temperature; and the succeeding compartments have temperatures conducive to gradual cooling.

* * *

Cutting Meat—Jay W. Vaughan, Chicago, Ill., to Vaughan Company, Chicago, Ill. No. 1,747,461. Feb. 18, 1930—The use of a band saw for cutting meat and fish, especially steaks, chops, and the like, ordinarily resulted in tearing of the flesh. By using a band upon which the teeth are set at a very slight angle and running it at a speed between 2,100 and 2,400 ft. per minute, the flesh is said to be cut with the same smooth surface that is obtained when a knife is used for cutting. Gristle, fat, and bone are, of course, also cut by the saw.

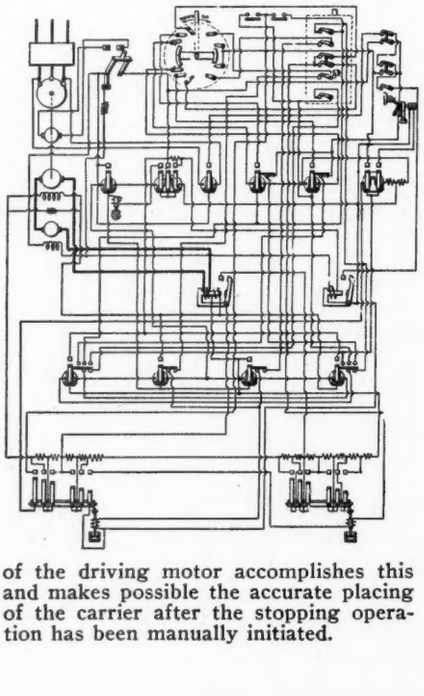
* * *

A Suction Filling Valve for Sirupers—Albert R. Thompson, San Jose, Calif., to Anderson-Barn-Grover Mfg. Co., San Jose, Calif. No. 1,753,729. April 8, 1930 — The container to be filled is raised on a cam-supported platform which causes the container to press against a compressible member. This member fits tightly on the edges of the container to prevent overflow, and at the same time causes a centrally located valve head to open and to allow the inflow of the sirup. An air vent through the axis of this valve head and shaft is attached to a vacuum system to aid the escape of air and inflow of sirup.



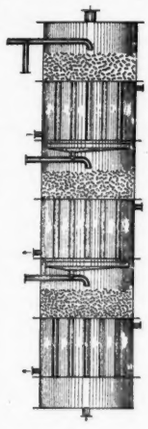
* * *

Automatic Motor Control—Edwin W. Seeger, South Milwaukee, Wis., to Cutler-Hammer, Inc., Milwaukee, Wis. No. 1,753,351. April 8, 1930.—This variable-voltage control system is applicable to elevators and the like in order that the carrier may be stopped automatically at a desired point. Automatic plugging



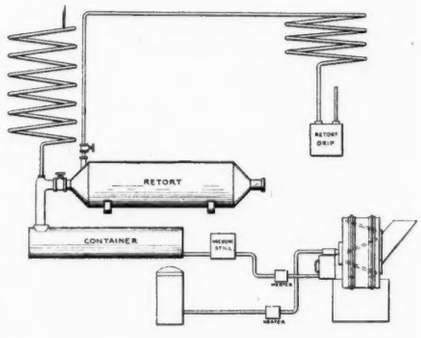
of the driving motor accomplishes this and makes possible the accurate placing of the carrier after the stopping operation has been manually initiated.

Deodorizing Fats and Fatty Oils by Atomizing—Herman Bollmann, Hamburg, Germany, to Mary Fulford Foster, Washington, D. C. No. 1,754,598. April 15, 1930. —The fats or fatty oils in free liquid form are sprayed by means of steam nozzles of injector form into a steam-charged compartment and are allowed to flow through a layer of heated bodies through heated tubes to a collecting pan in a partial vacuum. The process is repeated downward through a series of these layers until the fats or oils are sufficiently purified. The obnoxious odors and vapors are drawn off by suction at the top and the purified oil is drawn off at the bottom of the column of these treating layers.



* * *

Destructive Distillation of Wood for Preparation of a Meat Cure—Ernest H. Wright, Kansas City, Mo. No. 1,753,358. April 8, 1930—Hickory or some such suitable hardwood is destructively distilled from a revolving retort. A temperature of 100 to 160 deg. F. is maintained to drive off objectionable gases and vapors, and then is gradually raised to 900 deg. F. to obtain the desirable



vapors which are condensed and recovered. This condensate is used to impregnate crystals of saltpeter for the preparation of a meat cure having the flavor and odor characteristic of the wood used in the process.

* * *

Malted Peanut Butter—Joseph L. Rosenfield, Alameda, Calif. No. 1,756,702. April 29, 1930.—In this process the germ of the nut is sprouted and the germination is allowed to proceed to a desired degree before the nut is roasted, blanched, and made into butter. It is claimed that this treatment produces a product having a high vitamin content and an unusually rich nutty flavor.

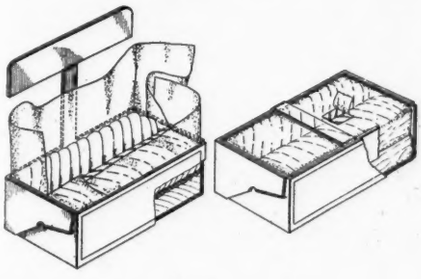
* * *

Removal of Spray Residues—Arthur R. Maas, Los Angeles, Calif. No. 1,754,173. April 8, 1930 — Lead arsenate residues are removed from the fruit by washing in a non-acid solution of sodium thiosulphate. It is claimed that a solution containing 3 to 5 lb. of thiosulphate to a gallon of water removes the arsenate residues without injury to the fruit. It is suggested that soap or alkali be added to the solution to lessen the surface tension of the solu-

tion, to aid in the wetting of the fruit, and to penetrate any oil residue that may be present.

* * *

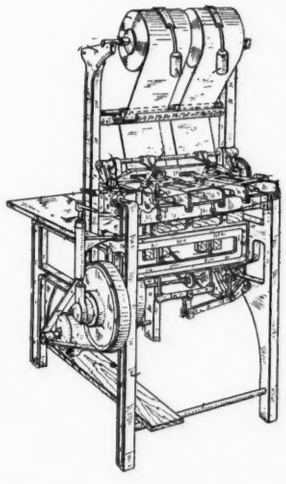
Consumer Packages for Frozen Foods—Clarence Birdseye, Gloucester, Mass., to Frosted Foods Company, Dover, Del. No. 1,759,682. May 20, 1930.—This carton is so designed that in size and



shape it economically lends itself to a vapor- and moisture-proof transparent lining and to the material, such as filleted fish, to be packed. Also it leaves at least one surface of the lining sufficiently exposed to permit examination of contents through the transparent lining without breaking the moisture-proof and airtight seal. When subjected to the quick-freezing process the package is frozen solid in a convenient form for handling, storage, and inspection.

* * *

An Adjustable Package Wrapping Machine—George D. Ratliff, St. Louis, Mo., to Pioneer Butter Wrapping Machine Company, Jackson, Miss. No. 1,753,868. April 8, 1930—This machine is adjustable to wrap articles and pack-



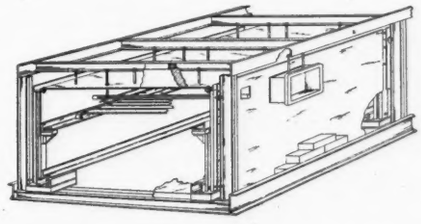
ages of various sizes such as loaves of bread, boxes of cereal food, and bricks or cubes of butter, cheese, and confections. It is claimed to be automatic in operation.

* * *

Removal of Phenolic Pollution From Water.—John T. Travers and Oliver M. Urbain, Columbus, Ohio, and Charles H. Lewis, Harpster, Ohio, to the Ohio Sanitary Engineering Corporation, Columbus, Ohio. No. 1,754,068. April 8, 1930.—Phenolic bodies are recovered from water by addition of iron hydroxide, calcium hydroxide, and a catalyst. It is necessary to maintain a hydrogen ion concentration in excess of the value **pH** 10.8, and to supply iron hydroxide in excess of 4.4 grains per gallon and a catalyst-bearing material in excess of 30 grains per gallon in the water treated. Time of reaction period is at least 10 minutes.

* * *

Traveling Oven With Low Heat Absorption—Eugene Oscar Engels, Saginaw, Mich., to Baker Perkins Company, Inc., Saginaw, Mich. No. 1,752,158. March 25, 1930—This is a traveling oven of the inverted U-shaped tunnel type constructed to give a greater heat flexibility, low heat absorption capacity, and a steam-tight inner baking chamber. These properties, it is claimed, make possible rapid changing from one kind of baking to another, quick heating and



cooling of oven before and after baking, and a wide range of temperatures without crowding, straining, or otherwise injuriously affecting the internal mechanical equipment or the external walls and their fittings.

Copies of Patents

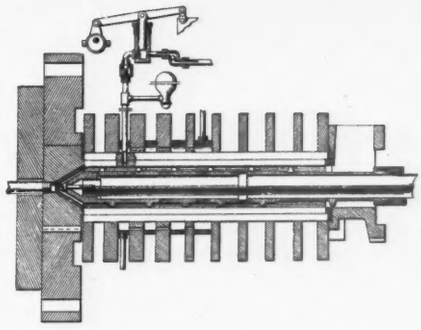
Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Water Purification by Use of Nascent Oxygen.—John T. Travers and Oliver M. Urbain, Columbus, Ohio, to the Ohio Sanitary Engineering Corporation, Columbus, Ohio. No. 1,754,129. April 8, 1930.—Polluted liquids are purified by the addition of calcium hydroxide and an electrolyte. Liberated nascent oxygen oxidizes the putrescible content of the water.

* * *

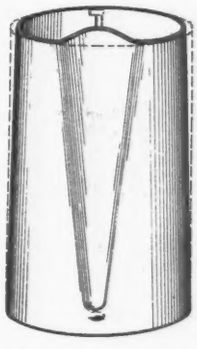
Mechanical Pressure Cooking of Cereals—Raymond T. Anderson, Cleveland, Ohio, to V. D. Anderson Company, Cleveland Ohio. No. 1,758,272. May 13, 1930—The machine described is a powerful gear-driven worm shaft inside a cone-shaped steam-heated shell. The part of the worm shaft that operates adjacent to the small end of the cone-shaped shell is smooth-surfaced in order to impart great pressure and heating effect on the material treated. The cone-shaped shell consists of longitudinally placed bars so arranged that, as the worm shaft forces the material into the small end of the shell, this material is progressively subjected to pressure and heat and at the same time moved in a longitudinal direction favorable to expulsion from the machine. As the definitely regulated quantity of material is forced



into the compressed area of the shell, a definite quantity of water is added and heat is applied to give the desired degree of processing.

* * *

Nesting Can Bodies — Norbert J. Schaal, Seattle, Wash., to Continental Can Company, New York, N. Y. No. 1,755,666. April 22, 1930 — This invention provides for deforming cylindrical can bodies that they may be nested one within another for economical transportation. Subsequently they are separated and returned to cylindrical form for further processing. The accompanying illustration shows how the side of the body opposite the seam



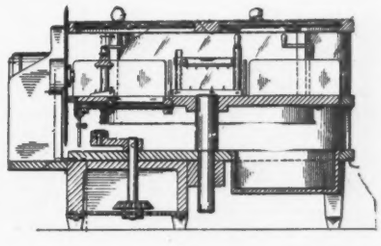
is forced into a wedge-shaped depression with rounded angles. The outwardly projecting hump at the rounded end of the depression and about ¼ in. from the edge of the can prevents the bodies from becoming too completely telescoped.

* * *

Non-Acid Smoke Treatment—Harden F. Taylor, New York City, to The Atlantic Coast. Fisheries Company, New York City. No. 1,760,091. May 27, 1930.—By this invention a regulated quantity of ammonia gas is added to smoke in the smoking of fish and meat to render it alkaline before it comes in contact with the fish or meat. In this manner the undesirable effects of the aldehyde and the acid constituents of the smoke are prevented, and the color, flavor, and texture of the material treated are claimed to be improved.

* * *

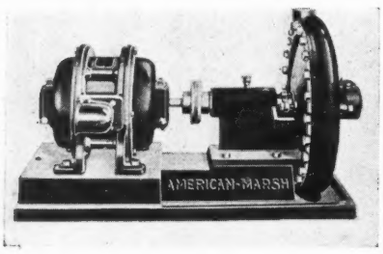
Adjustable Automatic Slicing Machine—Manuel Lemos, Caldwell, N. J. No. 1,755,883. April 22, 1930—In this automatic slicing machine the materials to be sliced are held in place by clamps rotatively attached to a movable table and are oscillated over cutting knives mounted in fixed positions. These clamps are adjustable to accommodate the material to be sliced.



Manufacturers' News And Equipment

High-Pressure Pump

TYPE Q centrifugal pump, designed and manufactured by the American Steam Pump Company, Battle Creek, Mich., is a single-stage, single-suction, centrifugal pump that operates against heads up to 300 ft. and has a delivery of 5 gal. per hour. A single-vane im-



peller with knife edges reduces power loss due to disk friction developed by the impeller as it comes in contact with the liquid. A specially designed adjustable stuffing box eliminates short-circuiting of the liquid from the pressure side of the pump. The stainless-steel shaft and impeller are welded into one rigid unit and operate on lubricated ball bearings set far apart to carry the rotating element with a large factor of safety.

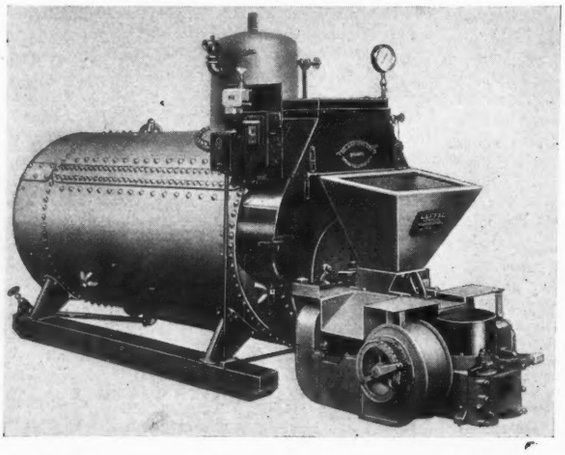
Underfeed Stoker for Scotch Marine Type Boilers

AN AUTOMATIC underfeed stoker has been designed by James Leffel & Company, Springfield, Ohio, that appears to meet the demands of the standard Scotch marine type of boiler with its small firebox opening. This stoker is made in sizes suitable for boilers ranging from 150 to 2,000 sq.ft. of heating surface and can be connected to existing as well as to new installations.

The stoker is a complete assembly, which is placed in front of, and made to rest on, the same level as the boiler itself. The forced-draft fan is directly connected to the driving motor, with the reduction gear for the stoker ram drive in the center. This gear has been simplified and the space required between the motor and fan has been reduced. The crank driving the ram revolves in a horizontal plane instead of a vertical plane.

A damper on the air intake of the face manually controls the forced draft air and a pressure switch mounted beside the combined starter and safety switch on the boiler smoke box automatically controls the complete unit. Steam turbine drive can be furnished, although the motor drive with complete electric control is standard equipment.

Automatic Underfeed Stoker

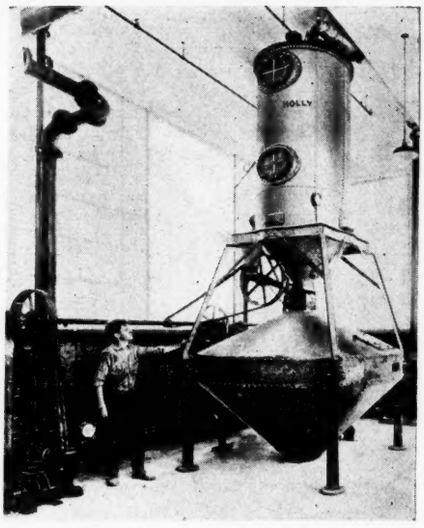


Pneumatic Conveyors Transfer Materials Economically

THIS pneumatic conveyor lends itself to clean transportation of granular or powdered materials from shipholds, railroad cars, trucks, and storage bins to higher levels or over intervening spaces to storage, grinding or filling machines, or bulk shipping containers. Minimum amount of manual labor is necessary in operating the conveyor.

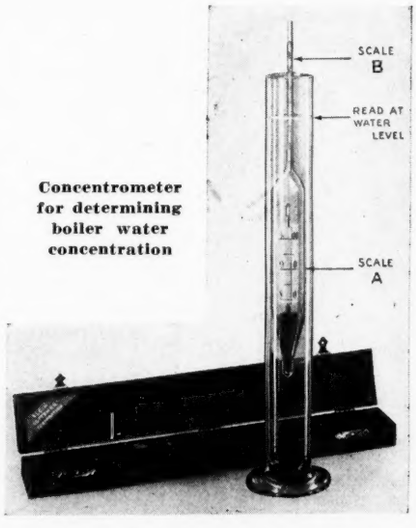
Because the material is handled in a continuous manner through airtight tubular ducts from the dump hopper or suction nozzle until it leaves the system at the discharge point there is little opportunity for contamination, spillage, or clogging. The length of the system from suction nozzle to discharge point may be from less than 100 ft. to as much as 900 ft.

The accompanying illustration shows the main receiving station in a sugar-handling installation manufactured and installed by the Holly Pneumatic Systems, 100 East 45th Street, New York City. Systems installed by this manufacturer are said to handle satisfactorily such food materials as copra, grain, powdered and granulated sugar, and small nuts and seeds.



Determination of Boiler Water Concentration

CONCENTRATION of boiler water can now be determined readily by the concentrometer recently developed by the Elgin Softener Corporation, Elgin, Ill. This instrument shows boiler concentration directly in grains per United States gallon, and consists of a combination thermometer and hydrometer. The thermometer has a scale graduated from 80 to 100 deg. F., and the hydrometer scale, which reads directly in grains per United States gallon, is calibrated by 10-grain increments and has a range from 0 to 500.



Concentrometer for determining boiler water concentration

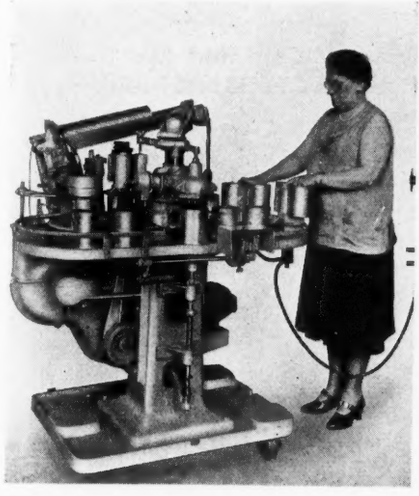
This "concentrometer" finds application in determining just how much blowing down should be done on a boiler or how often it should be done. By making all readings at a definite temperature—for example, 90 deg. F.—it is possible

to have the water of all boilers upon the same basis of comparison.

The instrument with its case weighs less than 2 lb. No technical knowledge or experience in chemistry is required to use it. It affords a practical method of supervising boiler-water control that is adaptable to the smallest or the largest plant.

Piston Displacement Filling Machine

BY EMPLOYING piston displacement to obtain measurement by weight or volume of the material to be filled into containers, the Stokes Multiplex filling machine has been perfected by the Paterson Machinery Company, 2401 Chestnut Street, Philadelphia, Pa. It is said to be designed to fill all types of self-levelling liquids or pastes



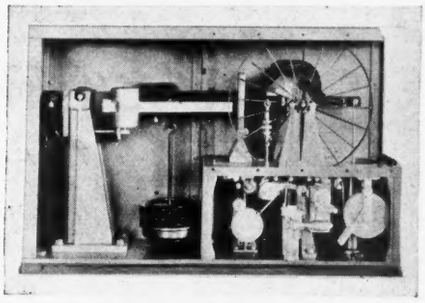
into jars or cans of any content up to 60 cu.in.; to handle friction-top, sanitary, screw-cap, or other standard closures, and to be quickly and easily adjusted for a change in size of container.

All parts coming in contact with the material handled can be quickly removed for clearing or replaced by spare parts to permit almost continuous operation of the machine. It is portable, operates from a light socket, is equipped with a dripless nozzle and with a mechanism to prevent discharge of material if a can is missing. This machine is said to fill, stamp code numbers on lids, cap, close, and discharge at the rate of 1,800 jars or cans per hour with one operator.

Automatic Printing of Scale Readings

THE automatic printing mechanism of the weight recording scale developed and manufactured by Streeter-Amet Company, 4101 Ravenswood Avenue, Chicago, Ill., is worthy of attention by food manufacturers and handlers, although it is not new in design or in application.

By means of this mechanism the human factor of error is eliminated from weighing and simultaneously a perma-



nent record of the weight is made. The mechanism is so constructed that it can be operated mechanically or electrically and it weighs and prints simultaneously without causing any delay in the operation of a conveyor line transporting the material being weighed. If the recorder tape should break, an electric contact is made immediately which sounds an alarm bell and turns on a signal switch. This prevents the passage of material over the scale without the weight being recorded.

This mechanism finds special application in those plants whose accounting system is based on weights of materials processed or handled.

The lift truck described on page 278 in the June issue of FOOD INDUSTRIES *is manufactured by the Barrett-Cravens Company, whose new address is 3250 West 30th Street, Chicago, Ill.*

◂◂ Manufacturers' Publications

Industrial Instruments — Charles Engelhard, Inc., Chestnut St. & N. J. R.R. Ave., Newark, N. J., has prepared for distribution an attractive looseleaf booklet on gas analyzers, pyrometers, electric resistance thermometers, and automatic temperature-control instruments.

Cleanliness and Sanitation—This 16-page booklet, published by the Mathieson Alkali Works, Inc., 250 Park Ave., New York, N. Y., is a compilation of excerpts from articles that appeared in the October, 1929, issue of FOOD INDUSTRIES. This symposium deals with the subjects "Market Milk," "Butter," "Cheese," "Ice Cream," "Condensed, Evaporated, and Dried Milk," "Meat Food Products," "Margarin," "Mayonnaise," and "Commercial Bread."

Automatic Temperature-Time Controllers—C. J. Tagliabue Manufacturing Company, 30 33d St., Brooklyn, N. Y., describes its recording and non-recording temperature-control instruments and fittings in illustrated leaflets recently published.

Combined Cutter and Mixer—The Hottman Machine Company, 3325-43 Allen St., Philadelphia, Pa., has issued a small leaflet describing a twin-screw, combined cutter and mixer for making sausage and meat specialties, for cutting vegetables and fruits, and for making cracker dust.

Multiple Retort Stokers—In a 48-page illustrated booklet, listed as catalog MR-2, the Combustion Engineering Corporation, International Combustion Building, 200 Madison Ave., New York, N. Y., shows in detail its super-station type multiple-retort underfeed stoker.

Refrigerators—Refrigerated display and storage cases as manufactured and installed by Ottenheimer Bros. Inc., Baltimore, Md., supply the theme of the illustrated booklet "Oreole Sales and Service Survey."

Compressors—Ammonia compressors of the vertical, single-acting, inclosed type, manufactured by York Ice Machinery Corporation, York, Pa., are illustrated and described in detail in the company's bulletin No. 146 A.

Arc Welding—General Electric Company, Schenectady, N. Y., in booklet GEA-995A, illustrates applications of arc welding in industry. In several illustrated leaflets attention is called to G-E strip heaters, inclosed starting rheostats for repulsion-induction motors, G-E automatic welding head and control, solid-shaft vertical induction motors, G-E Fabroil gears, type RKS Capacitor Motors, and G-E Textolite gears.

Valves—A 35-page catalog of printed and blueprint information and several leaflets describing and illustrating type and construction of sluice gates, shear gates, foot valves, flap and mud valves, vertical check valves, and motor-operated valves is now available from the Chapman Valve Manufacturing Company, Indian Orchard, Mass., exclusive sales agent for Coffin Valve Company, Squantum, Mass.

Pumps—Pump-Fax is a 64-page illustrated handbook on power pumping compiled by F. G. Switzer, professor of hydraulic engineering, Cornell University, Ithaca, N. Y. A copy of this handbook can be obtained by writing Goulds Pumps, Seneca Falls, N. Y. Ask for Bulletin No. 400.

Rotary Filters—Goslin-Birmingham Manufacturing Company, 82 Beaver St., New York, N. Y., in an 8-page pamphlet describes and illustrates the Vallez filters, which are designed to handle material ranging from colloidal suspensions to heavy granular precipitates.

Continuous Vacuum Evaporators. Zahm & Nagel Company, Inc., Buffalo.—Folder entitled "The Zahm Concentrator," showing method of operation, describing the principles employed, and how it can be used for deodorizing products, such as milk, or for concentrating liquids.

Copper and Brass. Copper and Brass Research Association, 25 Broadway, New York City.—Bulletin No. 54, an issue of the association's periodical devoted to the uses of copper and brass in food manufacturing. Much of the information contained in the bulletin is apparently at variance with the opinions of best informed food technologists. The discrepancy is traceable to the absence of any mention of the need of a protecting coating over the copper as, for example, in milk handling.

Packaging. Automat Molding & Folding Company, Toledo, Ohio,—Leaflet describing the Automat triplex wrapping and cartoning machine for butter.

Materials Handling. Lewis Shepard Company, 176 Walnut St., Boston, Mass.—Lift truck circular No. 100 describes the new "Footlift" truck for loads up to 3,500 pounds. A table of specifications for the various models is included in the circular.

Conveyors. Mathews Conveyor Company, Ltd., Ellwood City, Pa.—An illustrated booklet entitled "Dairy Conveyors that Last," describing the construction and operating characteristics of these conveyor systems for dairies.

Materials Handling. Lyon Iron Works, Greene, N. Y.—Bulletin No. 101 describes the Lyon utility truck, an all metal truck designed for nominal loads up to 500 pounds. Bulletin No. 102 describes the Lyon ball-bearing truck casters. Bulletin No. 103 describes the Lyon steel-frame skid platform for use with hand or electric lift trucks. Bulletin No. 104 describes the Lyon steel-frame industrial trucks for warehouse and factory use.

Food Plant Sanitation—A 20-page booklet published by Mathieson Alkali Works, Inc., 250 Park Ave., New York, N. Y., treats of the use of a calcium hypochlorite powder in food manufacturing plants. Note that calcium hypochlorite is used. In the June issue it was erroneously stated that sodium hypochlorite was used.

News of the Month

Effects of New Tariff Law on Processing Industries Do Not Appear Great

By Paul Wooton
Washington Correspondent

NOW that the tariff is settled and detailed analyses of the new act have become available, it is increasingly clear that little in the rate structure need vitally concern the food-processing industries. Although any sort of tax on the raw materials of the industry is not welcome, the statement made in last month's issue of Food Industries that the effect probably will be absorbed without being felt tangibly seems to summarize the situation.

The 1930 tariff was designed to benefit agriculture, but commodities on a heavy export basis cannot be helped much by this means. Despite their opposite viewpoints, for farmers and processers alike the result is nil unless the higher rates tend to increase prices in domestic markets. Obviously, foreign markets are virtually untouched in price reaction by an American tariff law.

There will be a few cases where the increases really register, because imports make up a ponderable proportion of domestic supply. Sugar is the outstanding example, but even here an increase of ¼c. per pound against Cuba cannot cause any great change in the situation. Faced with surpluses, Cuba has in the past absorbed a large part of the duty. The new rate makes it a little the worse for her without much effect on United States production, although Hawaii, Porto Rico, and the Philippines may benefit, and Java be kept on the outside.

Most of the other effective changes on foodstuffs are less important. Some of those on which price reaction may be felt are: olives, limes, maple sugar, almonds, Brazil nuts, cashews, chestnuts, figs, dates, frozen and dried eggs, tomato paste, and sesame oil. Some other increases which will be of slight benefit to farmers in some regions have no direct significance for the processers. For example, most green vegetables and garden truck took increases, but these will apply for practical purposes only to imports in the winter and early spring from Mexico and the West Indies, and to some Canadian shipments near the border. Obviously, these are not for canning purposes. In fact, they undoubtedly replace an equivalent quantity of canned foods in the national dietary.

The situation regarding Canadian crops is similar, the ratio of imports being negligible compared with domestic supply. On some items, American plants near the border may be at a disadvantage, especially as concerns milk for condensing purposes. The Buffalo millers are not hurt, as their milling-in-bond provision for Cuban trade is retained. Wheat remains at 42c. per bushel as set by presidential proclamation.

Olive oil took an increase on shipments weighing less than 40 lb. with the immediate container, but the duty on bulk oil remains the same. Sweetened cocoa and chocolate are subject to sharp increases, but the other chocolate rates are about the same, with some reductions. The industry benefited by the free-listing of most of the unground spices, although rates are retained to encourage grinding and packing in this country. Of further benefit were various increases on foods canned or otherwise preserved, although in most cases the imports are negligible.

COMING EVENTS

JULY

29-30—National Syrup and Molasses Association, Atlantic City, N. J.

AUGUST

25-30 — Pan - American Reciprocal Trade Conference, Sacramento, Calif.

Considering that 200 food items were changed, as published in the table in the May issue, and that nearly half the agricultural items in the bill were subject to revision, mostly upward, it is fortunate for the industry that agricultural tariffs appear to have so little effect, and that such effect as there is to some degree passed the processing industries. With prices dropping, the duties on imported foods bear an increasing proportion to costs, because they are mostly on a specific or "per-unit" basis which remains fixed whatever happens to price. But the large items of import such as coffee, coconut oil, bananas, and chocolate, are not affected by the Smoot-Hawley tariff.

In short, most branches of the industry can forget the tariff for awhile, but should keep watch on the new flexible provision whereby the President is given added power to increase or decrease a rate by 50 per cent. If this is exercised to the extent indicated, companies processing foodstuffs may be in a position to gain rather than lose by making a case before the Tariff Commission toward the reduction of tariff overhead on their import materials.

Retailer Blamed for Surplus Stocks of Butter and Eggs

THE huge surplus of butter, eggs, and related products that has raised stocks in storage to record figures is blamed as much on the retailer as it is on overproduction, in a report of a special committee investigating the subject for the New York Mercantile Exchange. Failure of the retailer to pass reductions in the wholesale price on to the customer, especially in the case of eggs, has held up the ordinary increase in consumption that should be the natural economic result, it was declared.

A nationwide advertising campaign "to inform housewives of the discrepancy" between wholesale and retail prices, and thus influence retailers to lessen their charges, is being planned as a drastic measure to reduce the excess of these products now on hand.

Some improvement in the cold-storage butter situation was reflected in the reduction of stocks on June 1 to slightly less than twice the quantity in storage on the same date a year ago, the Bureau of Agricultural Economics, U. S. Department of Agriculture, recently reported. Whereas butter stocks have been from two to three times as great in recent months as on corresponding dates a year ago, the bureau says, the storage supply on June 1 is reported at 50,330,000 lb., as compared with 28,369,000 lb. on June 1, last year.

Other dairy and poultry products were in larger storage supply on June 1 as compared with a year ago, but the bureau reports decreased holdings of meats and lard. Of apples there was the equivalent of 463,000 bbl. in storage June 1, as compared with 392,000 bbl. last June. Stocks of American cheese are reported at 49,045,000 lb. as compared with 47,641,000 lb. last June; frozen poultry, 61,202,000 lb., as compared with 41,643,000 lb.; and eggs, 9,174,000 cases, as compared with 6,705,000 cases a year ago. Canned eggs total 37,000,000 lb. more than a year ago.

Government to Study Canning Industry; Status of Food Legislation

A STUDY of the canning industry in an effort to analyze some of its weaknesses is being undertaken by the federal government. The investigation will deal largely with the engineering, management, and labor problems of the industry.

On the engineering side there will be a study of equipment to determine whether or not it is practicable to reduce bottlenecks in operation. Because of the seasonal character of the industry and the unusually high peaks with which it has to contend, these bottlenecks cannot be entirely eliminated, it is recognized, as it would not be economical to buy expensive equipment that would be utilized only for a few days of the year.

The extreme peaks encountered in this industry result in a large amount of overtime work. The study will attempt to show the effect of overtime work on the efficiency of the worker and on the quality of the product. In connection with charges that the amount of overtime and delay in operations can be laid at the door of inefficiency, management studies will be made of that aspect of the situation.

Facts will be gathered as to the advantages that may be gained by consolidations, by the use of larger units, and by increasing the number of products at each plant. The work is primarily in the interest of the small cannery. Many of these plants were located before the days of good roads and automobiles, when it was essential to have the plant near the source of supply. Under present conditions, it is estimated that 20 large canneries would serve Virginia in a much more effective manner than the 250 small ones now operating. In a large, well-financed plant many economies, impossible to attain in an enlarged kitchen—as some of the smaller canneries are called—could be effected.

Facts are to be developed as to the losses that have been sustained as a result of the marketing methods of the small cannery. It is claimed that many of these plants must sell their output at once, regardless of market conditions due to pressure from those who have provided the financial support. The program is along the lines of the British "rationalization" study which has resulted in a definite program of consolidation and an effort to place management in the hands of the most capable men available.

Mapes-McNary Bill in Conference

The Mapes-McNary bill amending the Food and Drugs Act to provide that substandard canned goods must be so labeled, passed the Senate June 6, but on June 18 the prospect of its enactment was uncertain, because of a deadlock between Senate and House conferees on an amendment offered by Senator Copeland and adopted by the upper house.

The amendment does not impair the purpose of this legislation, providing simply that all interested parties shall be given a hearing before the minimum standards are finally promulgated by the Secretary of Agriculture, but the House refused to concur, and the measure was sent to conference, with Senators McNary, Townsend, and Ransdell, and Representatives Haugen, Purnell, and Aswell composing the committee. No agreement was reached by the conferees at a meeting on June 18.

No action has been taken by the House Committee on Agriculture on the Hope bill proposing establishment by the Department of Agriculture of permissive standards for all grades of canned foods. There is no objection to this bill in principle, but officials of the Food and Drug Administration hold it would be difficult to obtain convictions for misbranding under the fine distinctions in grading that this measure would permit. Although the Hope bill does not compel the canner to declare the grade on the label, he would, of course, be liable to prosecution for misbranding if the content did not score up to the declaration.

President Signs Summers Bill

Every commission merchant engaged in handling fruits and vegetables in interstate commerce will be required to procure a federal license to carry on his business in the future. This is one of the terms of the Summers bill to regulate the marketing of fresh fruits and vegetables, approved by President Hoover on June 10. It is estimated by the Department of Agriculture that between 40,000 and 50,000 license applications will be filed. Payment of an annual fee of $10 is required, but otherwise the term of the license is limited only by suspension or revocation for violation of the provisions of the act. It becomes effective Dec. 1.

Price Maintenance Bill Received

In the event that the Capper-Kelly price maintenance bill passes Congress this session, it is expected that the processing and canning of private brand foodstuffs will be materially increased. This prediction is made by Representative Kelly of Pennsylvania, co-author of the bill, who believes that the chain stores will be forced into dispensing goods under their own brands, since they will be denied their present privilege of price cutting on nationally advertised brands.

It is Mr. Kelly's opinion that greater competition will therefore ensue between the private and the nationally advertised brands. In the bid for public acclaim that will follow, he believes that particular emphasis will be placed on the relative merits of the various processing and canning methods used. To meet the increased competition of the private brands, the nationally advertised products will make an even greater effort to sell their goods by identifying them with special processing methods. This will force the private brands in turn to work out and advertise exclusive methods of their own.

The Capper-Kelly bill proposes to prevent price cutting on trade-marked articles sold in competition, by permitting the manufacturers or producers to fix the retail price.

Few radical changes in the alcohol permit regulations are expected from the initial revision under the Williamson law. A tentative draft of the new regulations will be submitted to representatives of the alcohol-using trades for criticism early in September, but it is probable that changes incident to the transfer prohibition enforcement from the Treasury to the Justice Department will be an evolutionary process dictated by experience under the new dual system.

Apprehensive lest the authority granted to the Attorney General to participate in framing regulations and to veto permit applications would hamper legitimate industry if arbitrarily exercised, the alcohol-using trades have been somewhat reassured by the disposition of G. A. Youngquist, Assistant Attorney General, to leave industrial alcohol matters largely to the discretion of James M. Doran, whose title now is Commissioner of Industrial Alcohol. It is becoming evident that the Department of Justice will interest itself only in cases where fraud is suspected and will not subject legitimate industry to suspicious scrutiny.

Food Expenditures Surveyed

Household food bills averaging $556 amounted to one-third of the budget last year of one hundred Detroit families supported by Henry Ford's minimum daily wage of $7. The Labor Department has just completed a survey of the living standards of these 100 families to be used by the International Labor Office at Geneva in computing, at Mr. Ford's request, the equivalent wage that the company would need to pay to place laborers in seventeen European cities on the same general standard of comfort.

Milk and milk products represent 21 per cent of the family's food bill and are first on the table set by the workingman's wife. Meat is second, accounting for 19 per cent, and bread and other bakery goods third, amounting to 10 per cent. Beefsteak was on the menu occasionally, purchases by these 100 families averaging 38 lb. each during the year, at an average cost of 39c. per pound. Only 36 of the 100 families used ice, and this item cost only slightly over 1 per cent of the total expenditure for food.

The report gives not only the average cost of each item in the family budget but a description of each item and the quantity purchased, in order that the International Labor Office may compute the relative foreign cost of the Detroit worker's budget by pricing each of the 400 odd items in terms of both quantity and quality.

Confectionery Convention Stresses Constructive Planning

FROM the opening address by A. M. Kelly to the election of the new president, E. B. Hutchins, the meetings of the 47th annual convention of the National Confectioners' Association, held at the Stevens, Chicago, Ill., June 3 to 6, were characterized by an atmosphere of co-operative spirit and constructive planning for the future. Following the report of the committee on education and research by Chairman E. B. Hutchins, and the address of Stroud Jordan on confectionery problems, the convention unanimously authorized the appointment of a committee to formulate plans for and to initiate the formation of a candy research institute. Although the attendance was somewhat lower than it has been in past years—540 members and guests registered—those in charge consider it the best and most constructive convention held by the association.

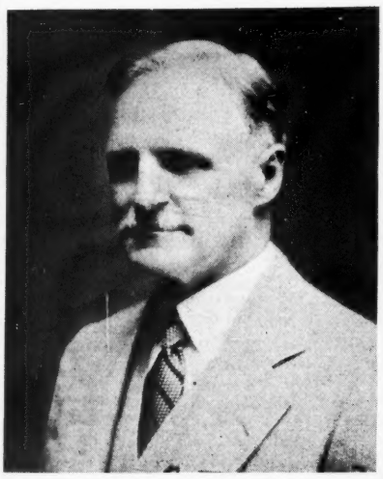
The change in public attitude toward confectionery was emphasized by President A. M. Kelly, Wallace & Company, Brooklyn, N. Y. He stated that at the present time more confectionery is being consumed by the American public than ever before, and that instead of it being regarded with suspicion and apprehension, or as a luxury, it is being sought as an article of food.

Emphasizing these points and elaborating upon the facts, St. Elmo Lewis, of Detroit, Mich., advertising and merchandising counsellor, discussed merchandising confectionery, and Stroud Jordan, chief chemist, Henry Heide, Inc., New York, pointed out some of the fundamental problems in confectionery manufacture and the importance of a more serious consideration of the factors involved in manufacturing processes.

Reviewing the co-operative developments as characterized by the establishment of various industrial research institutes; calling attention to the need for a means of preventing transients from entering the industry during periods of prosperity, as well as for a means of combating attacks by professional and other industrial interests, Alfred H. Williams, department of industry, Wharton School, University of Pennsylvania, pointed out the possibilities of an institute established by the industry for increasing the consumption of confectionery.

Studies in confectionery merchandising since the first of the year disclosed that in a certain organization, 42.7 per cent of all the commodity items sold represented 97.9 per cent of the tonnage, thereby showing that the remaining 2.1 per cent of the tonnage constituted 57.3 per cent of all items sold. In this same concern, according to Ranson R. Gilbert, grocery specialist, Foodstuffs Division, U. S. Department of Commerce, 28.7 per cent of all commodity items sold as special orders accounted for but 4.3 per cent of the tonnage sold. Regular orders, which accounted for 95.7 per cent of the tonnage, represented 71.3 per cent of the commodity items. He emphasized the results obtained through such studies of distribution expense, showing that in the plants studied since the first of the year, 33.3 per cent of the commodity items and 19.9 per cent of the tonnage sold on regular orders failed to show a net earning, and that 49 per cent of the commodity items and 50.6 per cent of the tonnage sold on special orders represented business taken at less than cost. That means that 37.8 per cent of all the commodity items and 21.2 per cent of all the tonnage sold failed to return a profit.

Reporting that $600,000 had been saved to the confectionery industry by the association's activity in having an 18c. duty placed on dried egg albumen instead of the proposed 60c. rate and that the 2-per cent discount for cash purchase of corn sirup represented another saving of $400,000 to the industry, Walter C. Hughes, secretary of the National Confectioners' Association, Chicago, Ill., stated the need for continued support of an energetic constructive program and for increasing the membership.



E. B. Hutchins

The newly elected president of the National Confectioners' Association of the United States, is a Doctor of Philosophy graduate from the University of Wisconsin, where he held an instructorship in the School of Chemistry, and is the first technically trained man to head the association. He is president of the Bonita Company, Fond du Lac, Wis., and for the past two years has served as vice-president of the association and chairman of the committee on education and research.

National Confectioners' Association Officers

President, E. B. Hutchins, Bonita Company, Fond du Lac, Wis.

Vice-President, Chas. H. Haug, Mason, Au & Magenheimer, Brooklyn, N. Y.

Vice-President, Geo. E. Williamson, John G. Woodward & Company, Council Bluffs, Iowa.

Secretary - Treasurer, Walter Hughes, 111 West Washington St., Chicago, Ill.

Defeat of anti-sweet advertising campaigns and the action of the Federal Trade Commission against proselyting and unscrupulous advertising, as obtained by the efforts of the National Food Products Protective Committee, was reported by Chairman William F. Heide, Henry Heide, Inc., New York. It was stated that the committee had decided to remain intact and ready to function in case another occasion arose for its services.

The strenuous and fundamental work of C. S. Clarke, director of the advertising and educational department, in educating the public to the value of candy and in overcoming the temporary prejudice against confectionery was reviewed by George H. Williamson, Williamson Candy Company, Chicago, Ill., chairman of the advertising committee. The convention indorsed Director Clarke's activities and authorized their continuation and extension.

The development of a uniform cost accounting system, which is now available to any member of the association, was reported by A. H. Shotwell, Shotwell Manufacturing Company, Chicago, Ill., vice-chairman of the cost accounting committee.

In connection with the report of the survey and cost distribution committee the convention learned that, according to a preliminary report prepared by R. L. Purdon, Director of the Candy Survey, U. S. Department of Commerce, the sales of candy on a poundage basis had increased 9.2 per cent in 1929 over 1928, and that on a total value basis they had increased 2.67 per cent. According to reports of 14 manufacturers of chocolate products, exclusive of chocolate coatings, cocoa liquors, cocoa powder, cocoa butter, and the like, there was a value decrease of 2.71 per cent. Based on the reports of 462 manufacturing wholesalers, manufacturing retailers, and manufacturers of chocolate products, there was a value increase of 1.98 per cent.

The 84 exhibitors for the most part centered displays around designs, equipment, and product materials being shown or advertised for the first time, indicating that they as well as the confectionery manufacturers consider the present year a turning point in the evolution of the confectionery industry.

Sales of Ginger Products Hurt By "Jake" Scare

SALES of ginger ale, confectionery flavored with ginger, and even ginger snaps, are reported to have suffered as a result of the numerous cases of paralysis resulting from the use of bootleg Jamaica ginger, commonly called "Jake," that recently swept Southern and Western districts. Absolutely no basis exists for any alarm so far as these food products are concerned, Acting Commissioner of Prohibition B. R. Rhees has reported. In fact, the trouble appears to have its origin in a poisonous adulterant strictly confined to the illegal preparation.

Replying to a communication from the American Bottlers of Carbonated Beverages, Mr. Rhees wrote as follows:

"Reference is made to your conference with this bureau, at which time you called attention to the fact that the public is becoming prejudiced against ginger ale, and even food products flavored with ginger in the South and West, on account of the many cases of paralysis caused by the drinking of adulterated fluid extract of ginger. You stated that on account of this condition the sale of ginger ale in some localities has practically ceased.

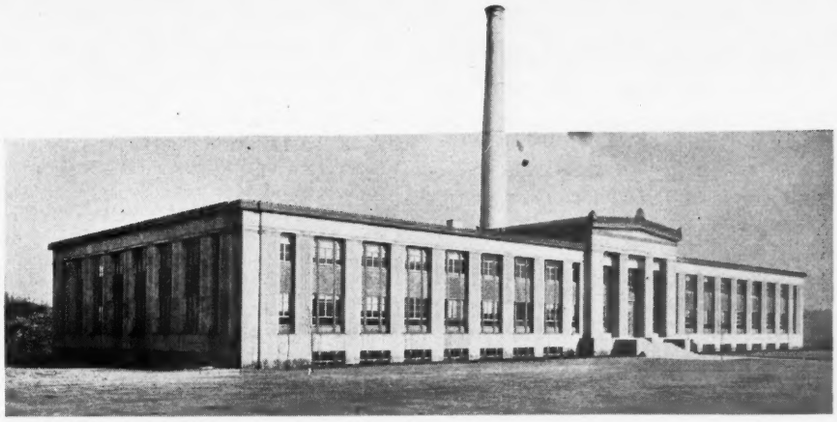
"You are advised that all the reports received by this bureau show that the trouble has been caused by adulterated fluid extract of ginger which has not been traced back to any permittee, and is evidently a bootleg proposition from the beginning. There is no evidence of any cases of paralysis originating from the beverage use of ginger-ale extracts or from ginger ale itself."

Imported Sardines Seized Under Anti-Trust Act

ABOUT 5,000 cases of Norwegian sardines were seized by customs agents at New York City on June 9, as a result of an alleged monopoly agreement among Norwegian sardine packers. This is the first time that such a procedure has been employed against foreign organizations. The action was taken at the request of the Department of Justice, because the companies involved are beyond the jurisdiction of the court and cannot be reached by a subpoena.

It is charged that an agreement has been made by all packers of Norwegian sardines to fix prices and to see that their terms are enforced by exacting pledges, under threat of boycott from persons doing business in the United States. The agreement has been made effective, and competition in Norwegian sardines has been eliminated, the Department of Justice charges.

The sardines were removed from a warehouse where they had been stored by C. Bjelland & Company, named as one of the parties in the conspiracy to restrain trade. Violation of the Sherman Anti-Trust Act and the Wilson Tariff Act were charged in the affidavit presented to obtain the search warrant.



Million Dollar Research Laboratory Completed

EXCELLENT facilities for research on the properties of aluminum and its fabricated applications have been made available with the opening of the new laboratory of the Aluminum Company of America at New Kensington, Pa. This newest example of the increasing realization of the importance of research for industrial as well as scientific progress has been fitted with facilities for metallurgical, industrial chemical, mechanical engineering, and chemical engineering work. The research staff will co-operate with those interested in the use of aluminum for various purposes in manufacturing plants.

Freight Rates for Canners Affected by Decision

A PROFOUND effect upon the transportation cost of canned goods and raw materials may result from an opinion of Examiner A. G. Hagerty, if sustained by the Interstate Commerce Commission. He held that the Commission has no jurisdiction over freight rates on fresh fruits moving intrastate from orchard to cannery for processing, even when the products are subsequently shipped into other states.

Recommending dismissal of a complaint filed by the Jacksonville Traffic Bureau relating to rates on fresh citrus fruits, Examiner Hagerty maintained that the inbound movement to the cannery is not an integrated part of interstate transportation subject to regulation under the interstate commerce act. The fresh fruit as such, he said, does not become a part of a business transaction in interstate commerce, because it is consumed during the process of manufacture within the boundaries of the state in which it is produced.

Fish Frozen in 1929 Sets New High Mark

THE quantity of fish frozen in the United States and Alaska during 1929 reached the largest proportions on record, amounting to 122,000,000 lb., with an estimated value at the cold storage warehouses of $15,000,000, according to data collected by R. H. Fiedler, of the U. S. Bureau of Fisheries.

During 1929, 122 freezing plants were operated. These were able to freeze about 3,617,000 lb. of fishery products per day. These plants were more numerous in the northern latitudes of the country and were located especially at large producing centers. For warehousing the frozen fishery products there were 168 cold storage warehouses in operation during 1929. These were able to store a maximum of 209,660,000 lb. of fishery products at one time. Storage plants are located mainly at points of production, although they are rather numerous at consuming centers at interior points.

Of the warehouses freezing and storing fish, 77 are located directly along the waterfront and 103 have railroad spur tracks connecting with one or more railroads entering the city in which they are located.

The important place which fisheries as a whole play in the economic life of the nation is indicated by the fact that at the present time over 132,000 persons are employed in the industry in United States and Alaska, the bureau reports. Of this number, 128,000 are commercial fishermen and 4,000 are persons employed in transporting fishery products from the fishing grounds to market.

The annual catch amounts to 3,090,000,000 lb., valued at about $116,000,000. Of this total annual yield, 2,662,000,000 lb. consist of edible fishery products and 428,000,000 lb. consist of non-edible fishery products which are manufactured into commodities used in the arts and industries.

In 1929, the production of canned fishery products amounted to 689,447,000 lb., valued at $101,065,000, and the output of byproducts was valued at $23,768,000. Cold-storage holdings of fish average about 56,000,000 lb. monthly, while 121,543,000 lb. of fishery products were frozen. The production of fresh and frozen package fish amounted to 84,397,000 lb., valued at $14,813,000. Imports of fishery products were valued at $66,566,000, while exports were valued at $23,830,000.

Landings of fish at New England ports during April, 1930, showed a large gain over last year both in volume and value according to the Bureau of Fisheries figures.

Trade and Industrial Activity At Low Ebb

JUNE witnessed new lows in the volume of American business. The third week of the month witnessed general trade on a plane about 11.3 per cent below the estimated normal, the previous low for the current business recession being witnessed during the first week of January, when general trade was on a plane 10.8 per cent below normal. The middle of June last year reported business operations of proportions 9.1 per cent above normal.

The current depression is the result of three economic factors: first, the business and industrial boom of 1928-29 which reached unprecedented proportions; second, the material reaction from the overstimulation of general business during 1928-29 accentuated by the radical drop in stock prices; and third, the coincidence of this American business recession with a similar business recession throughout the world.

Two favorable factors appear on the business horizon—the inherent purchasing power of the American people and the low and declining money rates. The view is fairly general, however, that the current situation—local and world-wide—is so marked by elements of weakness that sustained recovery will not be prevalent before autumn, and may possibly be delayed until the opening of 1931.

That American manufacturing operations in the country as a whole continued to be maintained at a near-balance is shown in the fact that during the first five months of 1930 manufacturing activity did not vary by more than 2 per cent from the average for the period. Operations in the January-May period were 11.4 per cent under the level at the corresponding time last year, but were approximately the same as that recorded for the same period in 1928.

Some idea of how the food products industry has withstood the current business recession may be gained from a study of the range which has been witnessed in the common stock quotations of a selected list of 28 of these companies since the market crash of last fall. In general the stock of these companies quickly recovered from the low point of last fall, although in most cases the high for 1930 was not reached until in April or May. Since the middle of May, the trend has been downward until the middle of June finds many stocks very close to the low for the year. It seems probable that the low point in the present stock decline has been reached, with a slow upward climb indicated for the summer months.

Comparative stock-market quotations of 28 leading food products companies are shown in the accompanying table.

	Lowest Oct.–Dec. 1929	Lowest 1930	Highest 1930	Closing Bid June 21 1930
Beech-Nut Packing Co	43	50 June	70¼ Jan.	50
Borden Co	53	60⅛ Jan.	90⅜ May	73½
California Packing Co	63½	64 June	77½ May	64⅝
Canada Dry Ginger Ale	45	56 June	75⅜ May	58⅜
Cocoa-Cola Co	101	133½ Jan.	191½ June	167
Cont'l Baking Co., A	25½	18¼ June	52⅛ Feb.	19½
Corn Products Ref. Co	70	87½ Jan.	111⅜ April	90⅝
General Baking Co., Pf	121	105 March	125 Jan.	110
General Food Prod. Corp	35	46¼ Jan.	61½ May	52¾
Kraft-Phenix Cheese Co	27	38⅛ Jan.	55⅛ June	48⅝
Loose-Wiles Biscuit Co	39½	50½ Jan.	70¼ April	55⅞
National Biscuit Co	65¼	71 Jan.	93 May	73⅜
Nat'l Dairy Prod. Co	36	45½ Jan.	62 June	48⅛
Pillsb. Flour Mills	30	27½ June	37⅜ April	27½
Purity Bakeries Co	55	52 June	88⅜ Feb.	55
Quaker Oats Co	167½	205 May	293 Feb.	210½
Standard Brands	20	17 June	29¼ Feb.	18½
United Fruit Co	99	83 June	105 Jan.	86
Wesson Oil & Snowdrift	20	22¼ Jan.	29⅞ March	23
Wrigley, Jr	65	67½ April	73 April	70
Armour & Co. Cl. A	5⅛	4⅜ June	8⅛ March	4¾
Compania Swift Inter	25¼	21 June	38½ May	31
Cudahy Packing Co	36	38½ June	48 Jan.	38½
Adolph Gobel, Inc	9⅛	8⅜ June	19 Feb.	8⅞
George A. Hormel & Co	33	27 March	3½ Feb.	27½
Hygrade Food Products Corp	10	8½ June	15 May	9¾
John Morrell & Co	42	52 June	72 Feb.	52
Wilson & Co., Inc, pf	35¾	40 June	54½ March	40

Definitions for Soft Drinks Are Proposed

DEFINITIONS for root beer, root beer flavor, birch beer, birch beer flavor, cream soda water, cream soda water flavor, orange soda water, orange soda water flavor, lemon soda water, lemon soda water flavor, lime soda water, and lime soda water flavor have been proposed by the Food Standards Committee of the Food and Drug Administration, according to an announcement by W. S. Frisbie, chairman of the committee. The committee invites criticisms and suggestions regarding the proposed definitions from food officials, consumers, the trade, and all others interested. Communications should be addressed to A. S. Mitchell, secretary, Food Standards Committee, Food and Drug Administration, U. S. Department of Agriculture, Washington, D. C., and should reach him not later than Aug. 31, 1930.

The proposed definitions are as follows:

ROOT BEER is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and root beer flavor, with or without caramel color, and with or without harmless organic acid.

ROOT BEER FLAVOR, ROOT BEER CONCENTRATE, is the beverage flavor in which oil of sassafras and methyl salicylate (or oil of wintergreen or oil of sweet birch) are the principal flavoring constituents, and contains other flavoring substances, with or without caramel color.

BIRCH BEER is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and birch beer flavor, with or without caramel color, and with or without harmless organic acid.

BIRCH BEER FLAVOR, BIRCH BEER CONCENTRATE, is the beverage flavor in which methyl salicylate (or oil of sweet birch or oil of wintergreen) and oil of sassafras are the principal flavoring constituents, with or without other flavoring substances, and with or without caramel color. Methyl salicylate is the predominating flavor of the product.

CREAM SODA WATER, "CREAM SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and cream soda water flavor, with or without caramel color and with or without harmless organic acid.

CREAM SODA WATER FLAVOR, CREAM SODA WATER CONCENTRATE, is the beverage flavor in which the principal flavor is derived from vanilla, tonka, vanillin, or coumarin, or any combination of them, and contains other flavoring substances, with or without caramel color.

ORANGE SODA WATER, "ORANGE SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, orange soda water flavor, and citric acid.

ORANGE SODA WATER FLAVOR, ORANGE SODA WATER CONCENTRATE, is the flavoring product in which oil of orange, or terpeneless oil of orange, is the essential flavoring constituent.

LEMON SODA WATER, "LEMON SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, lemon soda water flavor and citric acid.

LEMON SODA WATER FLAVOR, LEMON SODA WATER CONCENTRATE, is the flavoring product in which oil of lemon, or terpeneless oil of lemon, is the essential flavoring constituent.

LIME SODA WATER, "LIME SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, lime soda water flavor, and citric acid.

LIME SODA WATER FLAVOR, LIME SODA WATER CONCENTRATE, is the flavoring produce in which oil of limes, or terpeneless oil of limes, is the essential flavoring constituent.

TRADE NOTES

CALIFORNIA FISH PACKERS' ASSOCIATION was formed by the amalgamation of the Tuna Packers' Association of Southern California and the Sardine Packers' Association at a joint meeting in Los Angeles on June 6. The combined organization represents nineteen fish canners whose output is 90 per cent of the California total. It is planned to maintain a research laboratory.

J. L. FERGUSON COMPANY, Joliet, Ill., recently acquired the National Packing Machinery Company, Boston, Mass. The facilities of the two organizations will be linked to provide a complete line of packaging machinery.

GOSLIN - BIRMINGHAM MANUFACTURING COMPANY, Birmingham, Ala., has merged with the Whiting Corporation, Harvey, Ill., it was announced on June 19. The latter organization manufactures a wide range of industrial equipment, and the Goslin concern is prominent in the manufacture of sugar-refining equipment.

GRENNAN BAKERIES, Buffalo, N. Y., recently opened a new million dollar bakery with a public inspection and a radio broadcast of the proceedings. It is said to be the largest cake unit in the country. Charles A. LeFevre is manager of the new plant.

INTERCITY WESTERN BAKERIES, LTD., has recently been formed by the consolidation of eight bakeries in western Canadian cities. The merger was sponsored by the Lake of the Woods Milling Company, Ltd. The new company's capitalization will consist of $1,500,000 first mortgage 6½ per cent bonds, $350,000 par value 6 per cent cumulative convertible preferred stock, and 130,000 shares of no par value common stock.

MACKECHNIE BREAD COMPANY, Los Angeles, Calif., was recently purchased by the Langendorf United Bakeries.

NATIONAL BISCUIT COMPANY has made plans for acquiring the Bishop Company, a baking company having plants in San Diego and other California cities. This acquisition would mean a further expansion of the National Biscuit Company on the Pacific Coast following completion of the acquisition of the Pacific Coast Biscuit Company.

OWENS-ILLINOIS GLASS COMPANY, Toledo, Ohio, has acquired the Berney-Bond Glass Company, of Clarion, Pa., including the Pennsylvania concern's factory at Columbus, Ohio. The acquisition of the Berney-Bond will give the Owens-Illinois company an entrance into the milk-bottle manufacturing field, a product not made by the Toledo concern heretofore. There will be no change in the management policies or the personnel of the Berney-Bond company. The company will be operated in the future as the milk bottle division of the Owens-Illinois company.

RED WING CORPORATION, Dayton, Ohio, a Borden Company subsidiary, has absorbed the Chillicothe Bottling Company, it was recently announced. P. E. Bennett, president of the Red Wing, will be president of the merged concern, operating under the same name. F. L. Allen, vice-president of the Red Wing, will hold a similar position with the merged company. The Chillicothe firm owns a $500,000 ice and ice cream manufacturing plant and bottling works at Chillicothe, as well as smaller plants at Portsmouth, Ohio, and Huntington, W. Va. It will be operated as a branch of the Dayton concern. Total consideration involved in the merger was about $1,000,000.

VAN CAMP PACKING COMPANY has completed plans for acquiring the Jewel Tea Company. Several officers of the latter organization will take part in the executive management of the merged organizations, it is reported. The effect of the merger upon the wagon-route distribution system of the Jewel Tea Company is not definitely known.

WESTERN SUGAR REFINING COMPANY recently completed a new departure in sugar operations when it arranged to have organizations located in the East refine Philippine raw sugar for use in the Middle West. The refining will be done on a toll basis by the Pennsylvania Sugar Refining Company in Philadelphia and the Spreckels Sugar Company, New York. This procedure is declared to be cheaper than refining the raw sugar at Pacific ports and transporting over the Rocky Mountains.

PERSONALS

STEPHEN MOULTON BABCOCK, professor emeritus of agricultural chemistry at the University of Wisconsin and inventor of the test for butterfat in milk that bears his name, has been awarded the first annual Capper prize of $5,000 and a gold medal for distinguished service to American agriculture. The formal award will take place in October.

R. I. BENTLEY, for ten years president of the California Packing Corporation, resigned recently to become chairman of the board of directors of the same corporation. ROBERT M. BARTHOLD, a vice-president of the corporation since 1920, and general sales director since 1923, succeeds Mr. Bentley as president. J. K. ARMSBY, former chairman of the board, becomes chairman of the advisory committee. R. L. Pratt, sales manager, was elected a vice-president. Both Mr. Barthold and Mr. Armsby have been with California Packing Corporation since its organization in 1916.

J. WILLIS BLUE has been elected president of the Citizens' Wholesale Supply Company, Columbus, Ohio, manufacturer and distributor of margarin and coffee.

F. L. CATTON, formerly in charge of the Berkeley (Calif.) plant of the Langendorf United Bakeries, Inc., has been named manager of the Seattle (Wash.) plant, which was recently purchased by the Langendorf United Bakeries, Inc., from the Davidson Bakery Company.

E. J. FENNERAN has been appointed director of sales of the National Dairy Corporation, New York City. He formerly occupied a similar position with the General Ice Cream Company, Schenectady, N. Y., now a subsidiary of the dairy corporation.

O. L. INMAN, dean and head of the biological department of Antioch College, Yellow Springs, Ohio, has resigned to take active charge of a research project to determine the secret of chlorophyll. The project is being financed by C. F. Kittering, vice-president of General Motors, who donated $200,000 for the purpose.

W. F. MEYER, Warner-Jenkins Company, St. Louis, Mo., was elected president of the National Association of Manufacturers of Fruit and Flavoring Syrups at its recent annual convention in New York City.

JOHN E. SCOTT, Atlanta, Ind., recently purchased a tomato canning plant at Kirklin, Ind. He will carry on operations there during the coming season.

DALE G. STEELEY, formerly general superintendent of W. F. Schrafft & Sons Corporation, Boston, Mass., has resigned to act as consultant for Noel & Cia, Lda., in Buenos Aires. He sailed for South America on June 20.

WARREN N. WATSON, formerly chief chemist of the U. S. Tariff Commission, resigned on June 4 to become secretary of the Manufacturing Chemists' Association of the United States. DEXTER NORTH, Dr. Watson's assistant in the chemical division, was named acting chief and probably will receive the permanent appointment.

OBITUARY

FRANK J. BAUMERT, president of F. X. Baumert & Company, manufacturer of fancy cheese, now a subsidiary of the Borden Company, died on June 17 after a long illness. He was 66 years old and from an early age had been connected with the company founded by his father.

HENRY R. CLISSOLD, Chicago, Ill., founder and editor emeritus of *Baker's Helper*, died on June 1 at the age of 88. Mr. Clissold was instrumental in the organization of the American Bakers' Association and was the first secretary of the organization. He was editor and publisher of the magazine for more than 25 years.

BEN L. FORD, 62, prominent cheesemaker, died suddenly on June 22 from heart disease at his home in Newport, N. Y.

LOUIS A. GIRARD, president of the Girard Baking Company, Burlington, Vt., died on May 31. He was 42 years old, and had been connected with the baking industry since 1915.

ALFRED LETORT, internationally known sugar engineer, died recently in Paris, France. Mr. Letort was administrator of the Say refineries for many years.

JOHN C. SCHUBACH, of Canton, Ohio, was instantly killed on June 7 when his automobile was struck by a train. His wife died in the same accident. Mr. Schubach was president of the Sanitary Milk Company, of Canton, maker of ice cream and dairy products. He was also a director of the Telling Belle Vernon Company, Cleveland, and the Akron Pure Milk Company, Akron, Ohio.

New Construction

Bakery—Berges & Shelley, 52 Frederick St., Kitchener, Ont., is having plans prepared for a 1 and 2 story, 45 x 237 ft. bakery. Estimated cost $50,000. W. H. E. Schmalz, 129 King St. W., Kitchener, is architect.

Bakery—Corp., c/o I. Robinson, 3489 Jerome Ave., New York, N. Y., is having sketches made for the construction of a bakery and stores building at Beach Ave. and Merrill St. Estimated cost $50,000. Stern & Peyser, 9 West Prospect Ave., are architects.

Bakery—Grandma Baking Co., 735 Arlington St., Oakland, Calif., awarded contract for the construction of a 1 story, 130 x 150 ft. bakery at 671 Antonia St. to G. M. Hanson, 6534 Moore Dr., Los Angeles. Estimated cost $18,000.

Bakery—Holdenwang Banking Co., 98 Redwood Ave., Paterson, N. J., awarded contract for a 2 story, 75 x 80 ft. bakery at 163-177 Pennsylvania Ave. to J. H. Steele & Son, 48 North Second St., Paterson. Estimated cost $40,000.

Bakery—I. Keil, 349 Hawthorne Ave., Newark, N. J., will not construct 1 story addition to bakery. $40,000. F. P. Friedman, 305 Springfield Ave., Newark, Archt. Project abandoned.

Bakery—Valley Baking Co. Inc., c/o W. L. Trammel, 109 West Taylor St., Harlingen, Tex., awarded contract for the construction of a 1 story, 144 x 212 ft. bakery to Fogle Construction Co., Kansas City, Mo. Estimated total cost $90,000.

Candy Factory—Jenny Lind Candy Co. Ltd., c/o E. Robinson, Pres., 1010 Star Bldg., Toronto, Ont., plans the construction of a 5 story, 53 x 112 ft. factory. Estimated cost $100,000. J. A. Thatcher, 37 Cowan Ave., Toronto, is architect.

Confectionery Plant — Crackerjack Co., 530 South Peoria St., Chcago, Ill., will soon award contract for the construction of a confectionery manufacturing plant and power plant. Estimated cost $750,000. Nimmons, Carr & Wright, 333 North Michigan Ave., Chicago, Ill., are architects.

Bottling Plant — Coca-Cola Bottling Works, 860 Massachusetts Ave., Indianapolis, Ind., awarded contract for a 100 x 155 ft. bottling plant at 920 Ashland Ave., to W. P. Jungclaus, 825 Massachusetts Ave., Indianapolis. Estimated cost $43,000.

Brewery and Distilling Plant—Bimini Enterprise, Inc., T. S. Dillingham, Pres., Miami, Fla., awarded contract for a brewery $56,000, distilling plant $12,000, etc., at Bimini, Bahama Islands, to Ensley Construction Co., 503 Professional Bldg., Miami, Fla.

Distillery—Dunrobin Distilling Co., Grimsby, Ont., plans additional unit to plant, 6 story, 50 x 175 ft. Estimated cost $50,000. Private plans.

Casein Plant — Danish Creamery Association E. and Inyo Sts., Fresno, Calif., awarded contract for a 1 story casein plant at F and Inyo Sts., to T. M. Paulsen, 3666 Illinois St., Fresno. Estimated cost $45,000.

Creamery—Jersey Farm Creamery, San Mateo, Calif., awarded contract for the construction of a 2 story creamery to Sierra Construction Co., 233 3rd Ave., San Mateo. Estimated cost $40,000.

Dairy Plant—Isaly Dairy Co., 1033 Mahoning St., Youngstown, O., is receiving new bids for the construction of a 3 story, 120 x 120 ft. dairy plant at 3380 Emily St., Pittsburgh, Pa. Estimated cost $200,000. McCormick Co., 121 South Negley Ave., Pittsburgh, Pa., Archt.

Dairy Plant Addition—Northland Milk & Ice Cream Co., East 6th and Des Moines Sts., Des Moines, Ia., received lowest bid for the construction of a 1 and 2 story, 49 x 120 and 30 x 49 ft. addition to dairy plant at East 6th and Des Moines Sts., from Sugarman Construction Co., 725 Tuttle St. Estimated cost $50,000.

Milk Condensary Plant — Meyenberg Laboratories Inc., Salinas, Calif., plans the construction of a milk condensary plant. Estimated cost $200,000. Architect selected.

Milk Depot.—Sheffield Farms Co., 524 West 57th St., New York, N. Y., will receive bids about July 1, for the construction of a milk depot at Fulton St. and New York Ave., Brooklyn, also bids about July 10 for a plant at Westmoreland Ave., and Home St., New York; will soon award contract for a 2 story, 105 x 115 ft. milk distribution plant at Howe and Delaware Aves., Passaic, N. J. Estimated cost $150,000 and $150,000 respectively.

Milk Distribution Plant—Borden Farm Products Co. of Illinois, 326 West Madison St., Chicago, Ill., will soon award contract for the construction of a milk distribution plant on West 70th Pl. Estimated cost $100,000. E. C. Roberts, 105 North Clark St., is architect.

Cold Storage Plant—City Ice & Fuel Co., 6611 Euclid Ave., Cleveland, O., awarded contract for the construction of a 7 story cold storage plant at Penn and Pike Sts., Pittsburgh, Pa., to Blome Sinek Co., 33 South Clark St., Chicago, Ill. Estimated cost $300,000.

Ice Plant—Carbon Dioice & Chemical Co., Seattle, Wash., W. M. Foulton, Conrad, Montana, Pres., awarded contract for the construction of a plant at Farnham, Utah, to Frick Machine Co., Waynesboro, Pa. Gas from the Farnham well will be used for making dry ice. Estimated cost $150,000.

Ice Plant — Mayor and City Commission, Denton, Tex., will receive bids until July 14 for the construction of a 25 ton ice plant.

Ice Plant—Mongiello Bros., 625 Communipaw Ave., Jersey City, N. J., is having preliminary plans prepared for the construction of a 1 story, 100 x 100 ft. ice plant including ice machine, tank, storage rooms, etc. Estimated cost $40,000. C. H. Ziegler, 26 Journal Sq., Jersey City, is architect.

Ice Plant—Morgan Utility Co., Rector Bldg., Little Rock, Ark., will build a 1 story, 100 x 150 ft. ice plant at Dardanelle. Estimated cost $50,000. Work will be done by local labor.

Ice Plant—Silverwood's Ltd., H. O., 133 King St., London, Ont., awarded contract for the construction of a 15 ton ice plant at Peterborough to Cuff Bros., 30 McGill St., Peterborough. Estimated cost $50,000. Equipment awarded to Canadian Ice Machinery Co. Ltd., Villiers St., Toronto.

Icing Plant — Pacific Fruit Express Co., Pocatello, Idaho, is having preliminary plans prepared for building, machinery, equipment and 1,400 ft. of pier to ice 110 cars. $47,000.

Refrigeration Plant—Bell Bros., Mills Bldg., San Francisco, Calif., awarded contract for a 2 story refrigeration plant at 12th and Bernice Sts. to Cahill Bros., 206 Sansome St., San Francisco. Estimated cost $40,000.

Grocery Warehouse—Utah Wholesale Grocery Co., J. C. Deal, Gen. Mgr., Salt Lake City, Utah, is having preliminary plans prepared for a 2 story, 94 x 235 ft. grocery warehouse at 360 West North Temple St. Estimated cost $150,000. S. Winburn, Beason Bldg., Salt Lake City, Archt.

Yeast Plant Addition—Fleishmann Co., Front St., Peoria, Ill., subsidiary of Standard Brands, Inc., Madison Ave. and 57th St., New York, N. Y., plans the construction of a plant for barrel storage at Pekin, Ill. Estimated cost to exceed $40,000.

Feed Mill—Taylor Milling Corp., 1520 San Fernando Rd., Los Angeles, Calif., awarded contract for the construction of a 1 story, 52 x 55 ft. feed mill to Burrell Engineering Co., 458 Roosevelt Bldg., Los Angeles. Estimated cost $50,000.

Flour Mill—Acme Evans Co., 852 Washington Ave., Indianapolis, Ind., awarded contract for the construction of a flour mill at Blake and West Washington Sts., to C. J. Wacker, 3228 Central Ave., Indianapolis. Estimated cost $41,000.

Grain Elevator and Flour Mill — Harbor & Dock Commission, F. B. Shepherd, Pres., Oswego, N. Y., awarded contract for the construction of a grain elevator, 4,000,000 bu. capacity, also flour mill, 10,000 bbl. daily capacity to Fegles Constr. Co., 423 South 7th St., Minneapolis, Minn.

Grain Storage Bins—Des Moines Elevator & Grain Co., 712 Hubbell Bldg., Des Moines, Ia., awarded contract for the construction of twelve grain storage bins at 18th and Vine Sts., to Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo. Estimated cost $40,000.

Grain Bins—Globe Grain & Milling Co., E. R. Alton, Gen. Mgr., Ogden, Utah, awarded contract for the construction of forty grain bins, 25,000 bu. capacity each, to Jones Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo. Estimated cost $200,000.

Grain Elevator — Cargill Elevator Co., 1100 First National Soo Line Bldg., Minneapolis, Minn., awarded contract for the construction of a grain elevator at 76th and Dodge Sts., Omaha, Neb., to Eagles Construction Co., 523 South 7th St., Minneapolis, Minn. Estimated cost $3,000,000.

Grain Elevator — Navigation Dist. Commissioners, B. C. Allin, Secy., Houston, Tex., will soon award contract for a grain elevator, etc.

Grain Elevator — Peavey Terminal Elevator Co., C. C. Blair, V. Pres. and Gen. Mgr., Garfield Ave., Duluth, Minn., plans the construction of a grain elevator, 2,000,000 bu. capacity. Estimated cost $425,000.

Grain Elevator—Union Terminals Ltd., H. O. 300 Grain Exchange Bldg., Winnipeg, Man., plans the construction of a grain elevator, 1,000,000 bu. capacity at Port Arthur, Ont. Estimated cost $450,000. Engineer not selected.

Grain Elevator Addition—Ismert-Hincke Milling Co., 18th and Delaware Sts., Kansas City, Mo., awarded contract for addition to grain elevator, 500,000 bu. capacity, to Industrial Engineering Co., 620 Central Bldg., Kansas City.

Grain Elevator Addition — Vancouver Harbor Commissioners, Dunlevy Ave., will soon award contract for addition to grain elevator, 1,820,000 bu. capacity. Estimated cost $1,000,000. C. D. Howe & Co., Cassiar St., are engineers.

Grain Warehouse—Grain Warehousing Corp., Malad, Idaho, is having preliminary plans prepared for the construction of a grain elevator. Estimated cost $30,000. Morse Christensen, Malad, is engineer.

Rice Mill—California Rice Growers' Association, E. L. Adams, Pres., Chico, Calif., plans to rebuild rice mill recently destroyed by fire at Broderick. Loss $450,000.

Plant — T. Huston, Inc., Columbus, Ga., awarded contract for the construction of a 60 x 200 ft. plant for preserving fruit at Montezuma, Ga. to Parklap Construction Co., 84 Pine St., New York, N. Y. Estimated cost $100,000.

Packing Plant — American Fruit Growers, Avon Park, Fla., reported, awarded contract for a 120 x 175 ft. packing plant to C. V. York Co., Odd Fellows Bldg., Raleigh, N. C. Estimated cost $40,000.

Packing Plant (Citrus)—Auburndale Citrus Growers Assn., W. S. Stanford, Auburndale, Fla., plans the construction of a 55 x 71 ft. packing plant. Estimated cost $30,000. Tilden & McMichael, Auburndale, are architects.

Packing Plant (Citrus)—J. Apperson, Hidalgo Bank Bldg., Mercedes, Tex., is receiving bids for the construction of a 2 story citrus packing plant including equipment. Estimated cost $40,000. Private plans.

Packing Plant (Citrus) — Dundee Citrus Growers Association, R. W. Smith, Dundee, Fla., plans a 1 story packing plant. Estimated cost $40,000. Tilden & McMichael, Winter Haven, are architects.

Packing Plant Addition (Citrus)—Etiwanda Citrus Fruit Association, Etiwanda, Calif., awarded contract for a 1 story, 47 x 83 ft. addition to packing plant to Campbell Construction Co., 228 East Transit St., Ontario, $13,318.

Packing Plant (Citrus)—Texas Citrus Fruit Exchange, Mission, Tex., plans the construction of a citrus packing plant at Brownsville. Estimated cost $35,000. Private plans. Machinery and equipment will be required.

Packing Plant—L. Conner, Connersville, Fla., awarded contract for the construction of a 1 story, 80 x 150 ft. packing plant to Albinson & Co., Bartow. Estimated cost $32,500.

Packing Plant — Wilson Packing Co., W. W. Bowers, Supt., Albert Lea, Minn., plans addition to packing plant. Estimated cost $150,000.

Packing and Cold Storage Plant—Swift & Co., Union Stock Yards, Chicago, Ill., awarded contract for the construction of a 2 story packing and cold storage plant at Waco, Tex., to J. E. Johnson Construction Co., Waco. Estimated total cost $60,000. Most of equipment contracts let.

Packing Plant (Meat and By-Products)—McDonald Packing Co., Lubbock, Tex., will build a 2 story, 22 x 48 ft. packing plant. Estimated cost $35,000. E. G. Shelton, Lubbock, is architect.

Packing Plant (Meat)—J. Forest, Kingston, N. Y., will soon award contract for the construction of a meat packing plant. Estimated cost $150,000. U. S. Schlich, 136 Liberty St., New York, N. Y., is architect.

Packing Plant (Meat)—Wilson & Co., 4100 South Ashland Ave., Chicago, Ill., will build addition to meat packing plant. Estimated cost $75,000. Work will be done by owner's forces.

Sausage Factory—Chicago Sausage Co., 2910 Armitage Ave., Chicago, Ill., is having plans prepared for a 3 story, 265 x 345 ft. factory at Randolph and Carpenter Sts. Estimated cost $500,000. H. P. Henschien, 59 East Van Buren St., Chicago, Ill., is architect.

Provision Plant—Chase & Smallwood, 141 Broadway, New York, N. Y., awarded contract for a 3 story addition to plant at 246 Eldridge St., to O. Joroff, 336 East 95th St., New York. Estimated cost $40,000.

Warehouse — Armour & Co., 107 Hamilton Ave., Paterson, N. J., will build a 1 story, 70 x 145 ft. warehouse at 222-28 Ellison St. Estimated cost $150,000. R. L. Clark, 930 East 26th St., Paterson, is architect. Work will be done by separate contracts.